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Dealing exclusively with the topic of extreme rifle accuracy

PRECISION SHOOTING

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Precision

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if and when the deed is done.

The .25 Caliber Situation

We refer you to the questionnaire on page #41 of our May issue. Rich Kayser perhaps gave a bit of a misleading heading to the questionnaire (he WILL be flogged, of course; our methods of dealing with our writers were modeled after the British Navy's personnel practices of the 1740s. A bit of a flogging at the main mast, with the balance of the staff forced to watch . . . and a bucket of seawater to revive them afterwards . . . discipline ususally returns promptly thereafter).

The questionnaire, we now find, did not adequately make the point that an 85-88 grain flat base, hollow point, match grade bullet was in the works, as well as the proposed VLD bullet. Those who read the questionnaire closely had a little electric light turn on in their noggin . . . one who was looking out the window at the time swore that he saw the words "25 BR" appear in fiery letters in the sky.

Because the editor has always liked things that are kind of different (look at some of my friends . . . some of our writers . . . the asistant editor . . . the list goes on and on), we have sent off the questionnaire to Mr. Kayser with the comment that if his source (we know who it is; it's a PS advertiser bullet-maker) turns out a 85-90 grain match grade bullet . . . yeah, we want a thousand.

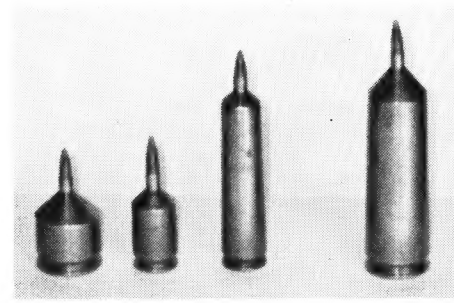
The idea of a .25 BR . . . is sort of intriguing., If you feel the same way, return a questionnaire. If the project goes ahead, orders will be filled in the order received . . . and we understand that he had orders for 50,000 before he could blink his eyes.

The Editor.

WILD WILDCATS

Dr. Lou Palmisano, the co-originator of the 6PPC cartridge, likes to amuse himself with the creation of whimsical wildcat cartridges, to be hauled out for the amazement and incredulity of that type of person that John Wayne used to call "pilgrim".

Geza Nagy, wearing his most sincere pilgrim face, and trying hard to look as though he believed every word of it, recently sent us a photo of the good doctor's latest efforts. For those of our readers to whom velocity is king, we are pleased to show you the following little examples of exotica (do not order from your local gun store just yet . . . we will tell you when the hour is at hand):



(From left to right)

1. The Short Fat One (how's that for a wildcat name?). This is a shortened 20mm cannon (Navy anti-aircraft machine gun), necked down to .22 caliber. Early estimates are that the forming dies will cost somewhere between $1,500 and $2,000 . . . not that bad a price really . . . since there are 46 dies in the set.
2. The Short Thinner One. This is a shortened 10mm machinegun round, necked down to .22 caliber. It is believed that this round was created for those wishing to use the new cartridge line, but who had wimpy tendencies.
3. The Tall Thinner One. This is a shortened .50 caliber machinegun round, necked to .22 caliber. This has been done before, by lesser mortals than Dr. Palmisano.
4. The Tall Fat One. This is a shortened 20mm cannon shell, necked to .22 claiber. However, unlike cartridge #1, enough case has been left here so that a MAN can get a LITTLE POWDER into the darn thing . . . and maybe coax a bit more velocity out of the case. This is it fellows, the one we have been waiting for. With this little rig, you don't have to worry about shooting "in heavy bush" . . . hell, you shoot right through TREES . . . even redwoods. On a test African safari, Dr. Palmisano was told by his guide that there was a trophy lion on "the other side of that hill". Since he was tired of walking at the time, the Doctor simply shot the hill; it was much easier. The lion (on the other side of the hill) naturally, was killed dead as a dodo. There IS one problem with the round, as the Doctor discovered. When his guide said, "shoot the first elephant, bawana; he's the best one of the herd" . . . unfortunately the bullet went right through the CONFOUNDED HERD. As we understand things, Dr. Palmisano is under detention in Kenya at the present, charged with destruction of a herd . . . without a vaild herd destruction permit. Dr. Palmisano is pretty unhappy with all this . . . but then again . . . so was the herd.

(Photo and statistics from Geza Nagy. Narrative from the editor).

PRECISION SHOOTING — EXTRA COPIES

We printed one thousand extra copies of the March issue of Precision Shooting, in response to several requests.

Shooters have, from time to time, asked us to make available, at reasonable rates, sample copies of Precision Shooting for sale at gun shows, exhibits, or whatever. Many shooters do not know of the existence of PS, and it is felt that this would be a good way to get the magazine, and its topic — "Extreme Rifle Accuracy" — in front of many new faces.

The March issue cover is Boyd Mace's varmint rifle . . . the cover was chosen to appeal to the general shooting public . . . rather than a specialized piece of advanced benchrest equipment.

The magazines are available at a price of $50.00, plus $5.00 shipping costs (for 50 issues), anywhere in the lower 48 states. Order from John Hollister, R.D. #2, Box 2395, Whitehall, New York 12887-9539.

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Kenny Jarrett

The Desert Rat
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Single Shot Jedi Knight
Warren Greatbatch

Precision SHOOTING

March 24, 1990

To:a dozen-or-so noted and revered gunsmiths
(when all else fails, Emma...go to flattery)

Re: pillar bedding

Gentlemen,

Since the match shooting season will shortly be upon us, I know that if I ever am to get a reply out of you...I had better write to you now, rather than later. Okay, consider yourselves as having been written to!

We have had several letters of inquiry lately about the pros and cons of pillar bedding...under various circumstances. The time seems about right for us to make this a topic of roundtable discussion.

Generally speaking, the benchrest shooters prefer the glue-in approach to things. It certainly has its points of appeal to the mechanical dumbkoff...which must include the editor, of course.A well glued-in action, in a fiberglass stock, virtually does away with bedding problems ...a Utopia that we could only dream about back in the 1970 era. On the other hand...glue-ins are expressly prohibited in the hunter class... and GENERALLY speaking...are not regarded as too practical on true field hunting guns. From what I have seen, most position shooters shun the concept as well, for their competition rifles. With that little bit of background...with which you are entirely free to disagree, in whole or part, as you might wish, by the way...let's get down to the knotty questions, gentlemen...

1.) For a varmint class benchrest rifle...can you see any advantages to a pillar bed job...over a glue-in? If so, please enlighten us as to what they might be...as you see things, anyway.

2.) On a hunter class gun, where you cannot use a glue-in approach, tell us briefly the bedding method that you currently use. If pillar bedded, what are you using for pillars?

3.) Is your pillar bedding method any different for wood stocks than for fiberglass/synthetic stocks? If so...what do you do differently?

4.) A reader from Oregon (didn't know that we had any Oregon subscribers, did you? Well, we do...and if we can get another one...we're gonna raise our prices around here) writes to inquire ...how many inch pounds of torque is put on the action screws after pillar bedding...he has heard 60 pounds, but is not sure. Should the screw tension be left "on" when the rifle is not in use? Would there be any difference in the recommended tension on a bench gun as opposed to a field hunting gun?

5.) Although not specifically mentioned as a method by our recent writers...would you prefer a bedding block approach to the pillar bedding approach, if you had a choice in the individual rifle?

6.) Finally, anything that you choose to comment about the general overall topic...be my guest.

As always...thanks for your help!

Kind personal regards,

Dave Brennan

Dave Brennan
Editor

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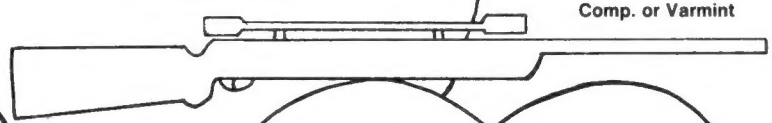

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PILLAR BEDDING

Continued

CLAY SPENCER

Dear Dave:

The following is in response to the letter that I received from you on 4/2/90. I am running a little behind; hope this gets to you in time for you to use it.

#1: In my opinion, a glue-in is the best way to go for a varmint class rifle with a synthetic stock. I can see no advantage in pillar bedding for this class, unless a wood stock is being used. In that case, there may be some advantage over the glue-in since pillars would run all the way through the stock, and a wood stock helps to dampen vibration.

#2: On a hunter class rifle, I would use aluminum for the pillars and bisonite for the bedding compound.

#3: My method is not really any different for wood stocks, but I prefer to pour the pillars when working with wood.

#4: I do not think there is any set rule for torque since all rifles do not perform at the same torque. Therefore, a rifle must be tried at different torques to find the best setting.

Light recoiling rifles may need only 25-30 inch pounds; heavy recoiling rifles and rifles with larger or longer barrels may need 30 inch pounds or more. Sixty inch pounds is about as high as one should go, and this would also apply to bench guns. If the bedding and torquing are done properly, I see no need to loosen the screws when not in use.

I think that a bedding block is one of the best bedding methods that you can use if you can live with the weight. I would remind you that the LV sporter rifle stock with which Tony Boyer did most of his winning was built by my father-in-law Tom Kelley, and it had an **aluminum bedding block.**

Judging by the performance of Tony Boyer in the last ten years, I do not think that anyone could say that a bedding block is not competitive. I think the main reason that the glue-in has been so widely used is that it is a very good method of installing an action, and there are no screws for the shooter to tamper with. And you know shooters, the first time a condition beats them out of a group (or they beat themselves out of a group), they blame the gun; and if there is a screw to turn, they are going to turn it! And if the screws are turned enough, it will be screwed up! If there are no screws to worry about, the shooter can take the time and effort he spends worrying about them and put them into reading conditions. That is what will help him get smaller groups.

I hope all of this will be of some help. Hope to see you soon.

Sincerely,
Clay Spencer
Rt. 1, Box 546
Scottsville, Va. 24590

FRED SINCLAIR

Dear Dave,

Tom Meredith has been doing all my personal stock work for a number of years and of course he was doing the stock work when Sinclair Inc. was building rifles.

Anything I say will likely parallel his comments.

However, if I may I would like to comment on the history of bedding, bench rest style, that is.

I believe it was Dave Hall who first introduced pillar bedding, prior to the introduction of fiberglass stocks, and anybody who has been in the sport a while can relate to the success of Dave's shooting and gunsmithing abilities.

Tom Seitz was using aluminum bedding blocks in his wooden stocked 40X and XP-100 "works of art" in the late sixties and early seventies. Most of which showed up in the winners circle all over the country.

Selby Wright and Jim Stekl experimented with barrel glue-ins in the early seventies. This was a method of gluing about four inches of the breech end of the barrel to the stock and floating everything else. Both these shooters a well as others had success with this.

As I recall, it was 1973 or 74, Ferris Pindell and I were shooting beside each other at a match in Richmond, Kentucky. We were sitting at the benches, rifles on the bags and just chatting when the rear guard screw just fell out of my rifle onto the bench. We both got a "kick" out of my neglect. Then jokingly, Ferris said "I better check mine." You guessed it! The rear screw on his rifle was loose enough to be removed with a fingernail.

Ferris stated, "Fred, if barrel glue-ins work why not just glue in the action and be done with it?".

Three days later I had all my bench rest rifles set up with the actions glued in and a week later a couple of Ferris' too.

Tthe following year, at the IBS Nationals, the Sporter class was won with an action glue in. The first major win for a glue in.

The popularity of glue-ins have increased to the point that practically every bench rest rifle being built today has the action glued in. Such popularity is primarily due to the fact that glue-ins are almost maintenance free, eliminating another thing to worry about. Insurance you might say.

If a bolt in bedding job goes sour it normally is a gradual problem, hard to detect, but normally when a glue in goes bad it is not difficult to trouble shoot, you gotta' use both hands to carry it.

Best Regards,
Fred

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BOB WHITE

Dear Dave

In response to your letter of 3/24/90 regarding pillar bedding I would like to say that I firmly believe that the late Dave Hall was the originator of this technique. As you know, Dave and I were very good friends. It was Dave who encouraged my gunsmithing efforts and shared much of his knowledge with me; this included his technique of pillar bedding.

1.) I see no particular advantage of pillar bedding over glue-in for varmint class shooting. Pillar bedding does, generally, include some portion of the barrel being bedded along with the action. This was done to increase the total bedding surface, which is a definite plus. However when the action becomes a semi-permanent part of the stock, as with a glue-in, I don't believe that this is necessary.

2.) I like to pillar bed all bolt together guns. I prefer to use pillars of Devcon, and see to their permanent anchoring in the stock with appropriate routing grooves and mortices. I do bed about 1½ to 2″ of barrel just ahead of the face of the action. Further, I relieve the forward and lowest portions of the recoil lug to prevent their binding in the bedding. Another step that I take, which I believe that few if any other gunsmiths take, is to use NO action screws while bedding. That is to say that I float the action in the bedding compound to insure NO STRESSES are bedded into the job. This is another point that Dave Hall very clearly made to me.

3.) I always use Devcon pillars in wood stock guns. However I use them in fiberglass stocks only when I consider the material between the action and the trigger guard to be too "punky" to resist compression as received from the stock maker.

4.) For many years I have used 40 inch pounds of torque on the front action screw, and 35 on the rear. If the action has three screws the middle and the rear get 35 pounds. I have had good success with these settings on both bench guns and field guns. I do not believe that it is necessary, or even desirable, to relieve screw tension regularly. However it IS desirable to CHECK tension periodically.

5.) I see no harm in using a properly machined bedding block. However I would still use pillars between the block and the trigger guard or stock escutcheon. Additionally I would feel better about the whole job if I used a thin layer of bedding compound between the action and the block itself to insure a perfect mating of surfaces.

As a final note, I believe that stock preparation plays an important role in a proper bedding job. The pillars are only part of the story. For example, sufficient bedding compound must surround the action to resist the "walking" tendencies in wood, and any flexing tendencies in synthetics. It generally takes me three to five hours to do a proper pillar bedding job on a rifle, due to preparation and the removal of excess material. However this has paid off in about 90 per cent of the cases with improved accuracy out of that rifle. In some cases with rave-about-accuracy over previous results.

Bob White

SEELY MASKER

Dear Dave

I received your letter of inquiry on glue-ins versus pillar bedding.

As a general rule of thumb, I do not glue in any repeater actions, and I always advise pillar bedding where possible or practical.

Readily adaptable to pillar bedding are the Remington 700 and 40X actions, and the Winchester Model 70. The Mauser action family, as well as the Ruger 77 are not adaptable, except for the tang screws. The front guard screw of the Mauser is in the recoil lug, and the Ruger 77 is angled, making pillar bedding difficult, if not impossible.

My pillars are made of machined aluminum, and are contoured to fit round actions, or are left flat for flat bottom actions.

I do not do glue-ins with wood stocks; these I pillar bed only. My front pillar is one inch round aluminum, and the tang pillar is a half inch diameter round aluminum. Socket cap screws are used, and the torque is not critical.

If a live-varmint shooting rig is a single shot, I see no reason why a glue-in would have any disadvantages in the field. Again, when we are talking glue-ins, we are automatically talking fiberglass or synthetic stock.

If I were making up a true field hunting rifle of any type I would not want a fancy paint job. I use McMillan stocks as a general thing, and they can be had in impregnated colors, with checkering patterns impressed therein, camouflaged, or even beautiful simulated wood grain patterns.

To address your inquiry about screw tension being left "on" when the rifle is not in use (with a pillar bedded rifle), I see no need to relax screw tension under such circumstances.

Finally, when talking about a pure benchrest rifle, be it varmint class or even a heavy bench bag gun . . . the glue-in is the only way to go.

Seely

Continued on next page

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PILLAR BEDDING

Continued

DAVE CUNDIFF I

Dear Dave.....and EMMA.

Thanks for including me in your list of revered Gunsmiths. Most of the time we are referred to as ornery, cantankerous, opinionated, and some other unprintable adjectives. (Editor: you forgot "expensive").

Even though I am not building as many benchrest rifles these days, I still incorporate all of my accuracy techniques in the building of live varmint and classic hunting sporters.

In 1892, a notable genius by the name of Paul Mauser, designed a turnbolt rifle action that to this day has not been improved on except for some minor improvements to make it more safe and for use in the commercial market. Along with the original design was a form of pillar bedding in the truest sense, with a solid steel escutcheon mated to the front receiver ring and a steel bushing at the rear tang. Over the years I have seen this bushing removed, for some unknown reason, when being fitted to a "semi-custom" wood stock, causing of course, a severe bedding problem due to the very thin receiver rails of the Mauser action. The cure of course, was to replace said bushing.

As I have stated in previous P.S. articles, there have been several referrals by other writers, that pillar bedding is a cure-all for inaccuracy in a rifle when in fact the problem was something unrelated to the bedding. If there is a problem with compression of the stock material between the bottom metal and action, then there would be a need for pillar bedding, and this includes both fiberglass and some soft or oil soaked wood stocks.

(1) A few years ago at a match in Visalia, California, one of the competitors rifles went sour for no apparent reason. After a close examination by the resident Gunsmith, Harvey Miller, it was determined that the glued in action had come loose from the 105 degree temperature that day. After a quick reglue job (the original had been done by one of our renowned gunsmiths) with some 5 minute epoxy, our shooter was ready for the next relay.

Most of the rifle ranges in the Southwest Region are very hot (100 degrees) during the match season. Places like Las Vegas, Phoenix, Visalia, and even here in Carson City. Therefore most of the rifles that I made up were "screwed and glued". There is no need for a torque wrench for the guard screws with this system, just snug. Even the mechanically "declined" should be able to do snug!

(2) The Hunter Class guns that I have built in the past and the live varmint rifles that I am currently building are bedded using Acra-Glass Gel with glass beads added. I have also used Devcon-F aluminum, but this was, at least to me, a pain in the posterior to work with. I have used several different materials for pillars, including 6066-T6 aluminum bar stock. I had a small supply of Monel 1/8 inch wall tubing about 3/8 O.D. that has since been exhausted. Lately I have been using valve guides from the air cooled Volkswagon engine. I get these from a friend who rebuilds a lot of Porsche and "Bug" engines, and the used guides are cheap (free). I turn them to a nominal O.D. and then cut a very course thread for the epoxie to adhere to. I have read in the past some comments about some different materials used for pillars expanding and contracting under extremes in ambient temperature. Just remember, Fiberglass is a very good insulating material.

(3) The answer to this would be yes, except for the fact that most of the wood stocked rifles are mostly variants of the '98 Mauser and a few pre-'64 Model 70 Winchesters made into high grade classic sporters.

(4) I feel there is no need to be concerned with the amount of torque that is applied to the guard screws when you use a relatively hard material for pillars. It takes quite a bit of pressure to upset most metal and snug is all that is required in most situations.

(5) A bedding block is a lot of trouble for the average stockmaker, and could add

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considerably to the final cost of the rifle. It would be different if you were working with one make of action and had access to a C.N.C. mill.

(6) I think I summed it up pretty well, at least from my own point of view, in the above unbiased statements. . . . you're welcome.

Yours truly
Richard E. Cundiff

DICK CUNDIFF II

Dear Dave,

I hope this "reaches out and touches" you in time to be included in my Pillar Bedding summary.

This last week (4-10-90), I finished a pillar bedding job in a McMillan varmint stock using a Rem. 700, Hart 26″ barrel chambered for the .22-243 Middlested, for use as a long range prairie dog rifle. (Boy they seem to be catching hell in the last few years!)

Anyway while I was mixing the epoxy something came into my old noggin that I failed to note in my original reply to your inquiry. This I feel might be of interest to some of the curious. I add black die to the epoxy compound and paint all non-bedded interior surfaces flat black. The color black dissipates heat faster than any other color, therefor my theory(?) is that the heat from firing will be absorbed faster by the fiberglass stock material.

Since I have been able to read (at a young age) I have been an avid auto racing enthusiast; (a few other noted gunsmiths have also had this affliction), Harvey Donaldson, Honorary President of the Corvettes of America and Bob Brackney and his Jaguars to name two that come to mind. Anyhow most high performance racing engines, Illmor Chevy, Porsche, Alpha Romeo, etc., are painted black not because it looks cool with all the stainless and chrome fasteners, but because the color black dissipates heat more rapidly. Also radiators and any other device that is used for removing heat.

Yours truly
Dick

Continued on next page

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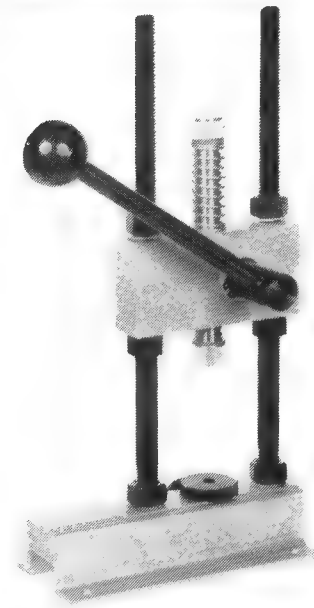

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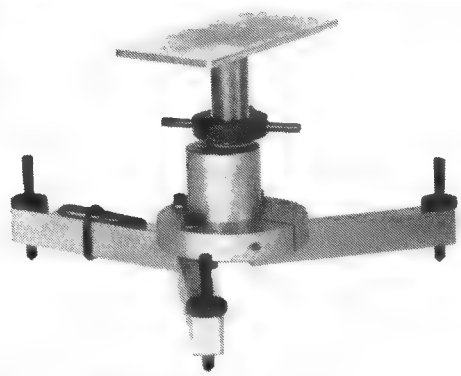

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PILLAR BEDDING

Continued

RON HOEHN

Dear Dave,

1. I personally prefer bedded rifles over glue-ins. Not that they shoot any better, but if done properly, they are every bit as good as a glue-in without the drawbacks. I truly hate to take emery paper to a fine custom action (I know, nobody will see it) but I just don't like it. If that was the only drawback, I would probably have actions glued in. I have seen a lot of actions come unglued. If it were a black and white issue of being glued in or not, it would be different, but it is not that simple. For openers, how do you know you have a good glue-in on day one, and to make matters worse, if the thing does come completely out in 3 years, when did it start coming unglued? Last month, 3 months ago, 2 years ago? I don't like those questions. I see shooters that suspect a rifle pulling and pushing on the barrel and stock. Sooner or later, enough pulling and pushing will loosen it up. If you can put a rifle and stock in a freezer to pop it out, what does shooting in sub freezing temperature do to the glue?

2. I do not do any stock work, but am sure the gentlemen use aluminum for pillars.

4. I do not use a torque wrench to tighten, but use the small end of the allen wrench for leverage. I think between 15 and 30 **inch** pounds should be about right. I leave tension on at all times.

5. If weight would permit, a bedding block would be as good as pillars, if not better. (Only better if the owner got a little aggressive with the wrench).

6. Just a short story about a local shooter that could not keep a gun glued in. He had at least 3 different people try their hand at gluing it in. Every time it came out it would appear to have been glued in without degreasing. Could some metals have oil impregnated in the pores that could not be cleaned good enough to insure a lasting glue-in — I don't know.

I like bedding for another reason. I have only seen a few glued in actions come out of a stock that showed 100% contact. I know a lot of guns, perhaps 90+%, are glued in and working fine. It has been a great cure for the poor bedding job.

Ron Hoehn

DAN LILJA

Dear Dave:

The subject of pillar bedding is an interesting one. As you said in your letter, benchrest shooters most often do glue-in their actions. The success of the glue-in approach is so well accepted that many shooters don't consider any other bedding method.

Living in the part of the world that I do, it has become necessary for me to fly on the commercial airlines to most of the big benchrest matches across the country. Sitting back in an airliner as you whisk over the country is a great way to travel. One of the drawbacks, however, is the occasional rough treatment that the shooting equipment gets by the baggage handlers. The rather sudden changes in temperature that baggage goes through is also, I think, hard on rifles.

I have had two rifles become unglued while on the airlines. It happened to my light varmint rifle going to the NBRSA Nationals in Midland, Texas, in 1988. I didn't realize what had happened until after the first yardage in which I shot it. It happened again to one of my heavy varmint rifles, coming back from Kelbly's range. Fortunately it was on the trip home this time. I have also shipped guns back and forth to matches via UPS. Another heavy varmint rifle came apart on one of those trips.

The point is, glue-in bedding is not quite as infallible as some people believe. As a result of the above incidents, I now have all of my benchrest rifles bolted in. All but one are glued and screwed. The other is just screwed, at least for now.

With screws also holding the action in place, the chances of a sudden jar to the rifle breaking the glue joint free are greatly reduced. The added weight of a quality pillar bedding job is, in my opinion, a small price to pay for the added security that screws offer.

A good question is, which is more accurate, a glue-in or a screw-in? I don't really think it makes much difference. The permanent bonding of the action to the stock in a glue-in probably adds to the overall stiffness of the assembly, but it can't make that much difference. I know of at least one benchrest gunsmith that recommends no glue, only screws to hold the action in place. His rifles shoot as well as any.

There is a difference, however, between a good pillar job and just a common bedding job. With a solid-pour benchrest stock, pillars are not necessary, in my opinion. With a shell-type fiberglass stock or a wood stock, though, pillars are important. They prevent compression of the stock when the screws are tightened. In the case of a wooden stock, they help prevent dimensional changes in the bedding due to changes in water content of the stock.

I've had good success using solid pillars made from 5/8″ diameter aluminum rod. When using the aluminum rod, the front escutcheon can be made from the pillar. I have also used pillars made from bedding material, poured into holes bored in the stock. This also works well if the pillars are poured and allowed to harden prior to the actual bedding. If the pillars and bedding are all poured at once, though, there will be too much shrinkage and the bedding may have to be done a second time.

Your question about the proper amount of torque to be applied to the screws or bolts is a good one. It is also a question that I don't feel I have an answer for. I generally tighten slotted screwheads about as tight as I can with a small screwdriver. The larger the diameter of the screwdriver handle, the more torque that can be applied. With allen head-type bolts, I use a moderate amount of bending of the wrench as my guide after the bolt head is snugged up. Not very precise terms or methods for an important operation, but as with many mechanical things, a certain feel is developed.

I am not all that fond of bedding blocks. No real reason; I just feel that an action that is properly pillar bedded in a stiff, quality stock can't be improved upon.

I have been enjoying the magazine and look forward to reading the responses of the others.

Best regards,
Dan Lilja

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JIM BORDEN

Pillar bedding of rifles seems to be a much discussed topic in accuracy circles in recent times. Indeed if one listens to the conversations and asks questions . . . one finds that there are several quite different types of pillar bedding "out there" in the field. And, still listening to conversations, as well as observing things generally, one notes that certain muscular types apparently are of the opinion that since they have pillar bedding in their rifle, this gives them some sort of a dispensation to really torque 'er down . . . with as much strength as they can bring to bear on those allen screws. Prior to getting into specific pros and cons of pillar bedding versus glue ins . . . and the pros and cons of different types of pillar bedding, let's first review a few key technical reasons for having any bedding surface at all.

The barreled action and the stock are two units of a rifle, and are most often separate pieces (at least in the context of this short article). Our objective is to fasten these two pieces together, and have, as a result, an accurate and precise shooting rifle. "Precise" from the standpoint that we want the rifle to hold point of impact from group to group, day to day, week to week, mouth to mouth, and so on. (Editor: sometimes our authors don't write all that clearly. Upon sober reflection I do believe that Jim wrote "month to month", rather than "mouth to mouth". Month to month does seem to make more sense, now that I ponder all this). Let's ask ourselves what are the key cause and effect relationships brought about by the connecting of the barreled action to the stock that would impact on the accuracy and/or the precision of the finished rifle. The following brief listing will include the key items that come most quickly to mind:

1.) Binding of the action
2.) Binding of the barrel
3.) Compression of the bedding
4.) Movement of the action after the shot is fired
5.) Movement of the barrel after the shot is fired

Keeping that little list in the back of our mind, we now approach the task of joining the barreled action and the stock . . . with the objective of preventing points one through five from popping up in our finished product. (Editor: wow, if gunsmiths have to memorize complicated stuff like this list, and keep repeating it over and over to themselves as they work . . . no wonder many of them are cranky and grumpy). Forces exerted on the stock/barreled action upon the firing of a shot are primarily in a rearward direction. (Editor: in the interests of presenting both sides of the story, we will allow equal space to any reader whose rifles recoil in a forward direction). Therefore it is not all that complicated to quickly see that we do not wish to have any sliding action take place between the action and the stock. Here is where the glue-in and the bolt-in approaches differ in how they achieve the same end results. A glue-in is built around the concept of having the barreled acton and the stock become a SINGLE UNIT. Gluing the action to the stock is intended to cause the two pieces to become a single unit, and eliminate potential relative motion between the stock and the barreled action. A bolt-in requires an abutment such as a recoil lug or vertical surface to transfer the force from the barreled action to the stock. It also requires a fastening technique that keeps the barreled action from rising out of the stock, or from shifting side to side. The fastening needs to be tight enough to keep the two parts together, yet loose enough to prevent bedding and/or action deformation. This point is what I believe is the LEAST understood in the shooting fraternity. In fact . . . many believe that more pressure is better!

Based on the objectives that one desires to achieve, I believe that the following guidelines are the basis of good practice for glue-ins:

1. Prebed the barreled action in the stock to provide a solid bedding surface.

2A. Glue the barreled action into the stock without screws or pillars. Or . . .

2B. If screws are desired as a "keep it together" (insurance for a possible glue failure), then use pillars with the prebed. The purpose of the pillars is to minimize stock and/or bedding deformation when someone JUST HAS TO put some torque on the action screws.

Now, on to bolt-ins. As indicated above, our desire is to provide a vertical recoil surface, and prevent sliding and parting motion between the stock and the barreled action. Of the five cause-and-effect relationships listed, three are optimized by using care in bedding and inletting. Enough free floating should be provided in the barrel channel to prevent binding of the barrel, or "multiple resting" places for the barrel. The best example that I can think of here is the pressure point on many production rifles. It provides a point of bind, and most of them are wide enough so that each time the rifle is fired, it can come to rest at a different place on the pressure point, resulting in changes in point of impact.

Compression of the bedding and/or the stock is primarily controlled by the pillars and bolting mechanism. Here is where we get into the pros and cons of different techniques of pillar bedding. Prior to investigating the techniques, let us first review the key technical considerations that need to be balanced. We want pillars that:

1. Provide minimum deformation under load
2. Don't move (relative to the stock)
3. Don't come loose
4. Maintain contact with the action over a period of time.

Deformation is a straight-forward technical principle. Most materials follow Hooke's law (see figure 1). For an applied load a particular deformation is experienced, and the load/deformation corse is repeatable until the material is taken beyond its yield point. However each material exhibits its own deformation versus load characteristics. We measure this characteristic by doing stress/strain curves and then calculate the slope of the curve in the elastic region of deformation. The slope of this line is known as Young's modulus, or the modulus of elasticity. Each material has its own unique modulus of elasticity. The larger the value for the modulus of elasticity represents smaller deformation for a given load. The modulus of elasticity of two example materials are given below, and illustrated in figure 2:

Aluminum:	10,000,000 P.S.I.
Steel:	30,000,000 P.S.I.

Now let us consider this technical material in practical terms . . . i.e., let us investigate the deformation of pillars. For the purpose of a quick comparison we will make two pillars with the same overall length, as well as outside and inside diameters. One pillar will be made of aluminum, and the other from

Continued on next page

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PILLAR BEDDING

Continued

steel. If we insert a bolt through each pillar and tighten a nut on the other end to the same torque on each pillar, we would find that the aluminum pillar would deform three times as much as the steel pillar. If we were to cast pillars of various epoxies we would find a range of different deformations. In fact many would exhibit plastic versus elastic deformation. This means that when we remove the load, the one that had experienced plastic deformation would not return to the dimension that it had before the load was applied.

Why go into all this technical depth? Well, it sets the stage for the tradeoffs that I am going to discuss concerning different pillar bedding techniques.

There are two basic approaches to pillar bedding, with many permutations applying to each technique. As a basic description, one approach uses aluminum/steel/brass or some other metal in conjunction with epoxy. The other approach is pour the pillars, using epoxy. Each of the approaches has its advantages, and its disadvantages. An advantage of using a metal pillar is that it provides a predictable response to loading, and is fairly repeatable. Of course the metal selected will dictate how much load can be applied prior to causing adverse bedding deflection. A disadvantage to the use of metal pillars is that they are known, on occasion, to become unglued, or at least exhibit the possibility of becoming unglued. The second approach is to pour the pillars, using one of the common epoxies (Devcon, Bisonite, Acraglas, Acragel . . . to name a few). With this technique we avoid the possibility of a pillar becoming unglued. However nothing comes free in life; poured pillars: 1.) have the habit of shrinking over time, and 2.) are less predictable for Young's modulus.

My personal preference is to use metal pillars. I use aluminum pillars in hunting and hunter class rifles, to gain a weight advantage over steel. I include instructions for torquing with the finished rifle. One of the frequently recurring questions that I get from shooters is "How many inch-pounds of torque should I use . . . 30 or 60 pounds?" This is a sure indicator to me that an understanding of why we bolt guns together is not in place. We only need enough pressure in the joint (bedding surface to action) to ensure that sliding or other relative movement does not occur during repeated firings, or exposure to cycling weather conditions. A firm snap as the front guard screw is tightened is enough to meet this objective. Of course we could apply three times the load if we used steel versus aluminum pillars . . . but what would we gain? The higher the bolt loading, the more creep we can expect, and the higher the probability of binding or deforming a portion of the bedding. In order to prevent metal pillars from coming loose I soak them in trichorethylene for an hour prior to gluing in. Before I adopted this practice I had some come loose.

I am quite certain that my above opinions will generate some differing opinions. (Editor: nonsense; we require all our subscribers to agree completely with everything they read in our pages. When we find evidence that someone disagrees with ANYTHING that we published . . . that subscriber is immediately terminated. Without refund, of course). I look forward to discussing different approaches with anyone.

JIM GREENAWALT

Dear Dave,

In response to your letter of March 24, 1990, regarding pillar bedding, Dave I am not one to write long lengthy responses, but I will try. Feel free to edit these responses any way you see fit. (I hope you will!!!!!)

1. I do not see any advantage to a pillar bedding job over a glue-in. There are two that I can think of. 1. If you're the type of person constantly repainting your stock. 2. If you have a wood stock you should not glue-in to a wood stock. I have a heavy varmint rifle with a 7 year glue-in and it still shoots.

2. On my Hunter Class rifles, I use aluminum pillars that are contoured to the action. Most all Hunter Class rifles are built with fiberglass stocks. I believe that aluminum pillars can sustain more compression and are more durable than epoxy type pillars.

3. The method of pillar bedding a glass stock and a wood stock are the same. The only difference is that you must take more care in preparing and pillar bedding a wood stock so not to damage the finish. Wood factory stocks are also inletted and careful preparation must be taken not to make a mess with the bedding compound. Most glass stocks that I work with are in the raw are not inletted or finished at this point, so they are a bit easier to work with.

4. Over the years I have heard of a couple of people using Torque Wrenches to tighten up their screws. On wood guns with no aluminum pillars, these tensions could constantly change due to weather conditions and wood swelling. With aluminum pillars these conditions stay pretty much stable and Torque specifications need not apply. A Torque specification measured in inch or foot pounds is a specification for a screw and a thread. With a 1/4 x 28 screw 60 inch pounds seems to be good.

5. Dave, let's get this one straight. Correct me if I'm wrong. A bedding block job is a bedding job with aluminum type pillars. And a pillar bedding job is a bedding job with fiberglass or aluminum epoxy pillars. As mentioned earlier, my preference would be to use aluminum pillars.

6. Most of my customers inquire about the difference between glue-ins and pillar beddings. In short, I think that the glue-in would be reserved for the competition rifle with the custom action (work all done), and the glass stock (can't get a better handle) complete with removable trigger bracket and/or pull pins.

The bolt-in or pillar bedding for hunting type rifles with magazines and wood stocks, untrue factory barreled actions and no removable trigger provisions.

Dave, thank you for this opportunity to respond to topics that I know your readers will enjoy and hopefully will gain some new found knowledge.

Sincerely
Jim Greenawalt

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BRAD ROSENTHAL ON .222 BRASS

Dear David,

Hope that this finds all well and running smooth with the coming season of misfortune upon us. This might be the year!

I continue to get responses from an article that I wrote about two years ago dealing with a cartridge called a .222x35. It seems that people are continuously looking for alternative designs to the PPC. My personal winter project has been a full length 22 BR with 40° shoulder intended for heavier bullets.

We got off to a rough start on this one because we went with the tried and true charts concerning such things as twist rate for bullet weight. Due to the fact that the food of choice for this project was going to be 65-70 gr. bullets we thought it would be necessary to speed up the twist a bit to stabilize things. It never really occurred to me that if a 1/14 twist was good enough for 6mm, with 60-70 gr. bullets, why not for .224 as well. Well, we started out at 1/10, what a bummer! Data on this barrel is not even worth passing on except for this one small piece of advice, don't bother. It still had not occurred to me about 6mm vs. .224 so I went to a 1/12. Not quite as bad as my first choice but still nothing to write home about. Now when I finally got over the shock of having two brand new and worthless 1.400″ barrels sitting in the corner I decided to give it one more try. This is also about the time I began to come to my senses about this twist business. Had I only asked in the first place. I talked with George Kelby and with T.J. Jackson and they both confirmed for me that with the velocities I would be obtaining that a 1/14 twist should prove to be correct. The important lesson to be learned here is don't just look at the norm. All the charts I have ever seen say that for a 70 gr. .224 bullet you should use a 1/10 or even a 1/9 twist. You need to look at some of the other factors. In my case, velocity was the controlling ingredient, not bullet weight. As an example I know a fairly successful hunter class shooter who obtains excellent results from a 1/15 barrel with 150 gr. .30's. He told me once he was going to try a 1/17!

So the big question, after all that suffering, how does it shoot? I honestly cannot give any conclusions yet as I have suspended testing to prepare for the upcoming benchrest season. I have had it out a couple of times with the latest barrel and things look pretty interesting to say the least. Almost unbelievable at 200 yards. I intend to have it out at the first unlimited match I attend this year, for 200 yards anyway. I have had it up to 3650 fps. over the skyscreens with 70 gr. bullets. If you are guessing case problems you would be correct. I will let you know how things go after this year and a little more testing.

The real point of this letter is to bring some information to light for all those interested in a deuce family cartridge of some sort. It seems that often one of the complaints about the .222 is brass. Where do I get good stuff, is there any such thing as good stuff, too thin, too soft, or something along these lines. If all you know about is Remington, Federal, and Winchester then I sympathize with you but there are alternatives. Following is a listing of my experience with about 50 different lots of brass from several other manufacturers.

RWS - One of if not the best .222 brass to be found. I have had 12 different lots of this brass in .222 and several lots of fired range brass. I have played with a number of other RWS offerings in brass and what is said about .222 applies to the others equally. In all cases the brass has been hard, by comparison, and more uniform than any other brass I have ever come across. All types, all manufacture, and Sako .220 Russian are included in that statement. All brass that have purchased new in the box has the same metallurgy but some of the range brass is different. The new brass is annealed about 1/3 and the range brass has not been. Uniformity seems to be the same but the range brass tends to be a little softer. If you are thinking about a 6x47 or any TCU design the only brass to consider would have to be RWS 5.6x50. I have given up trying to select cases. Just pluck them out of the box and go to work. RWS is the only brass I have the confidence in to do this. Available from The Old Western Scrounger in California and from Fred Huntington, also California. These are the only sources I know of but there are others most likely. You will find it pricey, about $13 per box of 20 for .222 and up for the others.

Sako - This is the one that would be my second choice. I have had 7 lots of this brass and all but 3 of them have been more than satisfactory. Uniformity rivals that of their own .220 Russian and that of RWS. If it can be faulted it would be in that it is a little on the soft side. What brass isn't a little sift at 60,000! The last that I saw commercially available was through a sporting goods dealer in New Jersey. Patterson some-

Continued on next page

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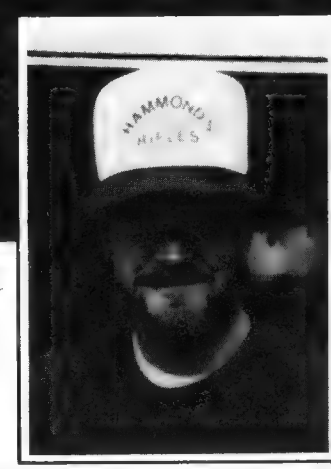

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BRAD ROSENTHAL ON .222 BRASS

Continued

thing or other in the town of the same name. It is available from Huntington in once fired range brass. I have had some of this and find no problem with it. Another source would be old Herters boxes of brass. Check the back label for manufacture, some was Sako, some was Norma, and I suspect others too.

Norma - Another excellent choice for the .222. I could not tell exactly how many different lots of this brass I have looked at but it is near 25. It seems Norma is one way or the other. Some lots are great and some not so good. The supply is on again off again, as with many Norma products, you can only watch and check with your distributors as to availability. I have found Buckeye Sports in Ohio to be a good source and if anyone has it they will. If you shoot .222 family for dogs and go through a lot of brass Norma is hard to beat. Uniformity is almost always better than anything domestic and the price is comparable.

Lapua - Once again a European company gets the nod. An outstanding case. Uniformity matches that of RWS. The high power shooters have been onto this company for a long time in using their .308, .223. and mag brass. The 5 lots of this brass that I have looked at have all been jewel like in manufacture. Primer pockets uniform and beveled, square case heads, and annealing about 1/3 of length. They are even exact length with beveled case mouths right out of the box. Only big concern is that you take a chance when purchasing it. Of the 5 lots I have had all but one was just too soft. Too bad. This stuff has to be seen to be appreciated. I have yet to see a case manufactured with this much care. Try Champion Shooters Supply. An outfit in Kentucky named Kendall was the main importer for some time but I have not had contact with them for several years. Ever hear of the Lapua .338 Magnum? A hot rod .338 developed by Kendall for 1000 yard sniping in the Marine Corp.

Other - Two other European .222 cases worth looking at would be Mauser Werks, head stamped DWM, and Hertinberger, head stamped HP. I have only had 2 different lots of this brass new and 1 small batch of range brass. It looks exceptional and I am currently using it in one of my unlimited barrels. If you buy some of the range brass that Huntington sells you might get a few pieces but not enough to work with. The other one, HP, is one that I have no experience with. I have never had any new in the box and quite honestly did not even know of its existence until I obtained some in a large lot of range brass recently. Suspect it would be of same quality as other European brass. To my knowledge neither of these two are imported into the US. If any of you out there knows different I would certainly appreciate the info.

? - Two more manufacturers of .222 I have heard good things about but as yet have not tested are IMI and PMC. I would be interested in hearing about these from someone who has taken them through the ringer.

Hope this gives some ideas about other sources of .222 brass. It is out there. You may have to look around a bit, chances are your local gun store will not have it, but once you get your hands on some good brass the .222 becomes a new story.

If you have not tried a duece family cartridge yet I can highly recommend that you give one a spin. If you have but just have not fooled around with it for awhile find some new brass, good brass, and try to renew your old friendship.

If you would like additional data on any of the above please feel free to contact me. If you are having trouble locating some of them I can probably help with that too.

Good luck with this shooting season David.

Best Regards,
Brad Rosenthal
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THE MAN BEHIND COOPER ACTIONS

JOHN J. GAMMUTO

I had heard the name Cooper mentioned in discussions relative to actions but had never actually seen one. On a recent shooting weekend I not only got to see one, but also had the pleasure of meeting Mr. Cooper.

I had decided to attend the Louisiana State Varmint Championships and it was there that we first met. I loaded next to Mr. Cooper that weekend. It didn't take long for me to warm up to the man. "Coop," like the rest of us, came to do some shooting and have a little fun. We did more than that.

I immediately sensed that Mr. Cooper was no ordinary shooter away from home for the weekend. The first thing I noticed about him was the manner in which he overcame the problem of his eyeglasses slipping down the bridge of his nose. I thought to myself, this guy has got to be an engineer. Nobody but an engineer would drill the frames out near the hinges, attach what looked to be silk cord, and loop it around the crown of his skull to keep his glasses in position. My suspicions were correct. He is an engineer.

Listening to him talk for a short period of time convinced me that he was no "flat bottomed" engineer, but one that understood the practical side of engineering mechanics and had logged plenty of time in a machine shop. I knew I could learn something form him if I did more listening than I did talking.

Coop slept in his high mileage pickup that weekend. He didn't strike me as the type that would pamper himself by stay'n in a motel. He was there for the full experience and that included the stars, the morning dew, and the birds singing in the trees; you have to admire that in a man.

Those of you that know Mr. Cooper know that he is not a youngster. He was as tired as we were by the end of the day, if not more so, but his mind was extremely active. He lectured, solicited opinions, and spoke with authority on a number of topics. His knowledge of advanced metalworking techniques seemed to captivate his audience. One look at his rifle, rest, and loading accessories told me something important about the man. He only purchased raw materials! With very few exceptions, all of his equipment was "designed and built by Cooper." The photos I took of his equipment will testify to this. Did you notice that his "stuff" doesn't look like our "stuff." He's a true experimenter and reminiscent of an era when shooters did their own work and refined things out of necessity. He seems to enjoy tinkering on the edge, if you know what I mean.

The shooting that weekend was difficult to say the least. The wind was gusting and the sun was in and out of the clouds, making it hard to get a handle on a condition. I believe winning the match was on Wilbur Cooper's mind as much as it was on mine. Although he didn't win a plaque, I'm certain that he felt good when he left the range that Sunday afternoon. He had discussed some subjects important to him, gathered some facts, made some new friends, and was the better for it.

Coop told me how he first got started shooting benchrest. It is an amusing story and one worth repeating. The way he tells it, it all started about 15-18 years ago at a Texas turkey shoot. Due to the limited number of shooters, the range owner decided that it was not to his economic advantage to hold the shoot. There simply weren't enough shooters to pay for the turkeys. Well, a couple of the fellas asked if it would be all right if they hung a paper target out at 200 yards. The owner agreed to let them

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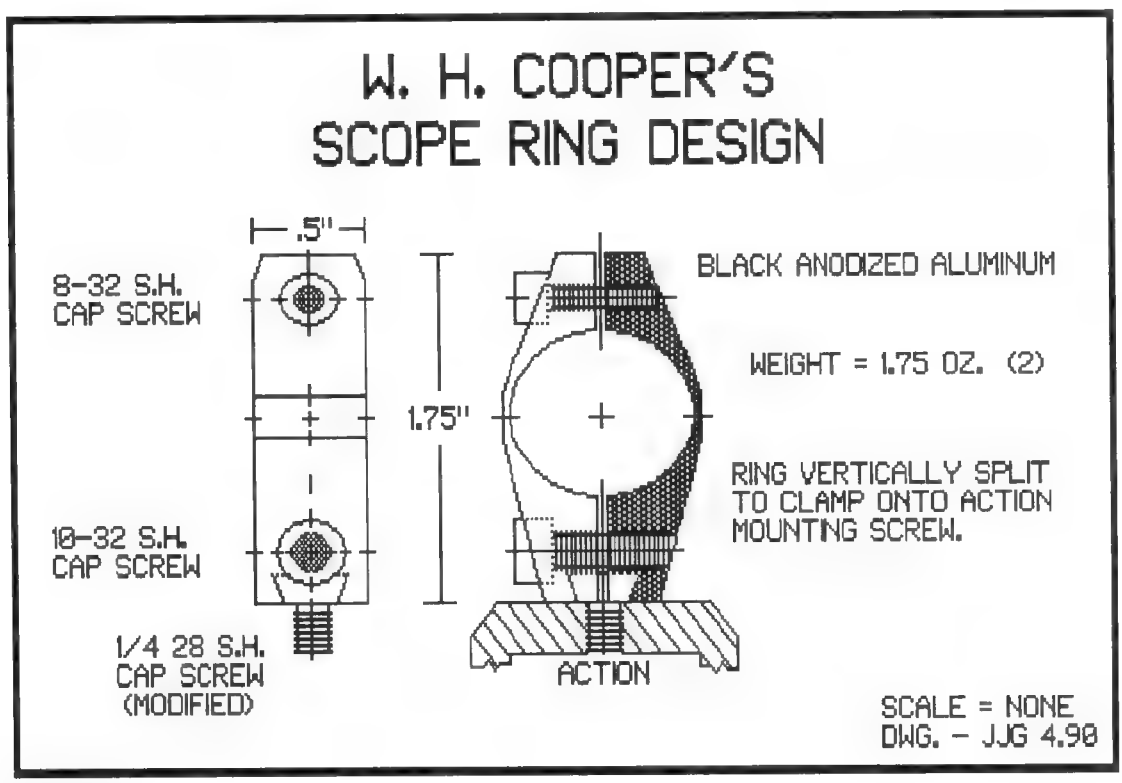

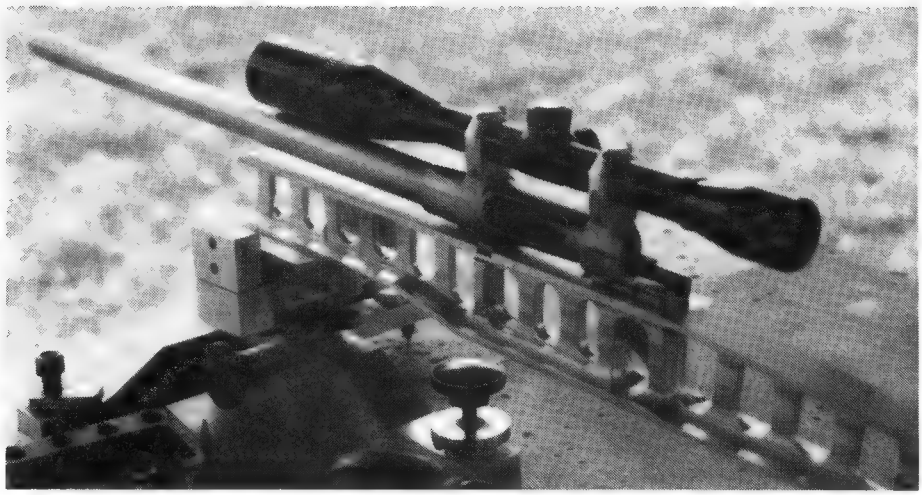

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THE MAN BEHIND COOPER ACTIONS

Continued

shoot, so they put an "X" on the target, put up a buck apiece, and took turns trying to hit it, closest man to the "X" taking the money.

Wilbur said he started out fine with his Sako .222 Mag and a 10 power scope. He was taking his share of the prize money. In the middle of it all something went wrong with the rifle. It just quit shooting without warning. Coop asked the fellas if they would mind if he dropped out. Apparently, some of the guys took exception to this and accused him of being a fair weather competitor. This made Coop mad.

He knew that rifle of his was something short of a true target rifle and decided that if he was going to shoot with those fellas again he'd have to get his hands on a serious piece.

Coop knew in his heart that he would enjoy besting those fellas even more if he could do it with a rifle he built himself, including the action. So he went out and bought himself some machine shop equipment, a lathe, milling machine, surface grinder, and all the gadgets required to undertake a project of this magnitude. A few months later he went back to the range to settle the score. One of his friends remarked, "Wilbur you must of spent $30,000 to win back a buck! Damn, what would have done if you lost $10.00?"

Today Mr. Cooper is currently working on a limited production of custom actions that will incorporate some new design features, and has promised to keep me informed of his progress. He recently sent me a set of his new scope mounting rings for inspection. I think you will find the mechanical principles employed are sound and easy to comprehend. The self centering feature of the ring design is based on the use of an action mounted 1/4 28 socket head cap screw that has been modified to a 6 degree taper. Coop tells me they are as good as he can make 'em.

John J. Gammuto

If you would like to contact Mr. Cooper to discuss his new actions or scope rings, he can be reached at the following address.

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THE FLYER

JOHN J. GAMMUTO

What I had in mind here was an article on the subject of "Flyers," how to identify them, causes of, and remedies for. After reading some of the responses I got from various shooters, it sounds as if they have done nothing but watch me shoot for the past several years. I didn't know others had been keeping that close an eye on my so called technique . . . four in and one out.

Seriously, it wasn't that hard to come up with a list of "experts" on this subject. We all know what flyers are. Some of us just have a little more experience than others interpreting the cause and taking corrective measures.

Only a novice or supreme egomaniac believes that all wild shots are the result of mechanical problems. Sometimes it's the guy pulling the trigger, at least this has been my experience. Knowing when to squeeze the shot off within the time frame allowed has been a puzzlement to me over the years.

The focus of this article is on the mechanical or procedural inconsistencies that result in misplaced shots on target, i.e., components, case selection, loading, shooting technique, etc. In other words, some of the things a rookie should concentrate on, what can he not do enough of, or too much of.

If you've been shooting for awhile but lack consistency, you might consider taking corrective action in one or more of the following areas. I guarantee it will have a positive impact on your aggregate scores.

1. Use a chronograph in load development efforts. Many times you **think** you have the correct load/bullet combination, when all you really have is the low or high end of an acceptable range of accuracy. Know just how fast that bullet should be traveling to maintain peak performance. Get your standard deviation at or below ten for optimum results. Make **minor** powder adjustments for extremes in temperature and atmospheric conditions as the season progresses. Never change lots of powder without chronographing it first. This insures relative burn rate consistency. The same rule applies to primers. Keep records. Write **everything** down; it will come in handy some day.
2. Keep that barrel, bolt, interior of the action, trigger, loading dies, cleaning rods, powder measure, scope, and anything else you carry with you to a match clean and free of foreign matter. Experiment with different solvents and **know** which products do what they claim to do.
3. Build or purchase a set of wind flags and learn how to read them. Know what every flick of the tail means on target. If you are unwilling to do this, you should consider taking up another sport. You're wasting your time and money.
4. Know **your** equipment. Forget about what everybody else is doing, or not doing, and concentrate on what **you** have to work with first. Owning your own reamer is a definite plus here. It provides you with an extra measure of confidence because you're always working with the same chamber and brass dimensions. Things go a lot smoother if you can control all of the things that can be controlled.
5. Spend the extra minute it takes to properly align your front rest and rear bag with the target. I cannot over state the importance of rear bag stability. I still say, take some of the sand out of your rear bag, and it will sit flat on the bench. When you pack sand into a bag so tightly that it stresses the seams you're bound to have something that resembles a football.
6. Find a shooting partner, someone that lives near by, and help each other with technical problems and mutual concerns. Develop your own information sharing network. Attend as many matches as you possibly can and keep your eyes and ears open. Most people are more than willing to help, all you need do is ask for assistance. No matter how many years you've been around, don't be ashamed to ask for another man's opinion on something. Actively support an organization that represents **your** goals and objectives.

Continued on next page

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THE FLYER

Continued

7. Spend your money wisely and insist on value for your dollar. Only align yourself with people and products that are tried and true. When you experiment you are doing just that. An experimenter likes to live on the edge. He's comfortable there, the average person is not. Rely on the experts until you become one yourself. Do not hang that title on yourself too early either, it can get embarrassing. Write to manufacturers and tell them what you think about their products, i.e., what you like, what you don't like, or what they can do to improve an existing product.
8. Know when to practice and when not to practice. Don't always look for calm conditions to practice in, it's OK for load development but that is about it. Most tournaments last all day and dead calm conditions are pretty rare. Study the effects of wind and mirage on your targets.
9. Shoot every match as if it were your last. All too often we get up on the line, start gabbing with our neighbor, and forget what we are up there for. Consistent Top Ten winners know why they are up on the line. Develop your powers of concentration to the extent that nothing bothers you. Never waste a shot. Only squeeze the trigger when there is something to be gained by doing so. Think about shooting small groups and nothing else. There is plenty of time for chit chat after the match is over.
10. Probably the most important rule of all — have some fun! Know the difference between fun and work. If you're not getting any pleasure out of the game, something is wrong. Take some time off and examine your priorities. When I go to a match I go to win, but if fortune is not with me, so be it. I think I've been around as long as I have because the shooting is secondary to being with old friends. It gives us a chance to laugh at ourselves because no one really beats us, we do it to ourselves.

John J. Gammuto

DWIGHT FURROW

If you can take your 10 lb. gun and a 6 power scope to your 100 yard range and sit down and shoot 5 groups, cleaning after each group, and keep them in the 1/4″ range under good conditions you're doing OK. A gun that is capable of doing this is a well tuned gun. A well tuned gun will have less flyers.

Will your gun put the 10th shot in the same place as the 1st clean barrel shot? Sometimes a few thousandths in seating adjustment will help this. (Less flyers from a gun that will do this.)

Go to your local range and fire a 5 shot group holding the vertical crosshair of your scope as close to straight up and down as possible. Then cant the rifle to the left, 20-30 degrees ought to be enough, and fire another group. Do it again canting the rifle to the right and see where the shots have impacted on the target. If all 15 shots are not in the same place you have a problem. More than likely you have dialed your scope out of center.

I've seen guns that the bullet didn't hit the target doing this simple test. I recommend the use of a mounting system that has left and right adjustment and use steel shims to insure proper centering of the scope. A scope that has been centered properly will have less flyers.

I've been fiberglassing guns for 30 years now and all I can say is have your gun fiberglassed with a 1990 system, not one that was developed in the 1940's.

A few years ago I fiberglassed a gun for an elderly gentleman, and had shot several excellent groups with the gun before turning it over to him. The owner came and picked up the gun and said he would see me at a local match on Sunday. When I got to the shoot, I saw that he had done a little "gunsmithing" of his own on the rifle. He put a piece of plastic milk carton between the barrel and the stock. He shot the whole winter this way without a win.

A properly fiberglassed job will help keep a cold barrel shooting in the same place as a hot barrel. (Less flyers.)

I turn my cases on a lathe. If I turn 100 cases I will have several with zero run out. After they have been fireformed I turn them again with the same set up. After the second turning most of the cases have zero run out.

I also return them to the lathe after they have been fired 5 or 6 times. This will clean up any brass that has flowed forward into the neck. Cases with zero run out will have less flyers.

I have a system for checking the crown on a barrel that your readers might be interested in too. Line the gun up on a 6 inch black bullseye at 100 yards. After the gun is lined up, take the bolt out, and look down the bore. Put the bore around the bullseye like you were shooting through a peep sight. Without moving the gun, look through the scope to see where the crosshairs are. If the barrel is straight and the crown is good, the crosshairs should only be a few inches from the group. I've seen factory guns that will have the crosshairs 5 feet from the target. You will have less flyers from a gun that can pass this test.

I believe that a rifle should have a name. When you get down to the last few shots you can have a personal talk with the rifle. (A look up into the sky and a few words may also help.) The name you choose should be well considered. A name I would avoid would be "Flyers."

Just before you're ready to squeeze that 5th shot off, you don't want to be heard saying "Come on Flyers!" Folks'll certainly think you're nuts.

Dwight Furrow

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BUD WELSH

When the subject turns to "flyers," I'm your man. Many consider me to be an expert on the subject.

I can think of several things I have done to semi bring this problem under control and improve my scores. The most important of which has to be, developing a routine for setting the rifle, front rest, and rear bag up properly. The importance of establishing a routine can not be overstated.

I first set the front rest so it's convenient to reach and adjust. The bag must be perpendicular to the target. The next thing to do is position the rear bag so that the rifle will recoil in a straight line to the target. You can do this by watching the crosshairs when sliding the rifle back and forth in the rests. The crosshairs should not move left or right. When this is done properly the bags "almost" function like a return to battery setup.

Another important item, for me, is not bumping the rifle with my shoulder during recoil. I like to shoot free recoil. If I contact the buttstock during the recoil motion of the rifle, I more times than not, will send one outside the group. For me, it is almost impossible to "shoulder" the rifle exactly the same each time, especially when you're shooting fast trying to catch that condition.

One mechanical problem that warrants mention is case neck tension. When seating bullets in cases, it should require the same amount of pressure from case to case. There shouldn't be any that are too hard or too easy to press into the case neck. Extremes in this regard should be avoided. In my experience, this accounts for a lot of vertical flyers.

Hope this will prove to be of help to someone.

Bud Welsh

NORM DIXON

John,

The subject of "flyers" certainly is broad enough in scope to maneuver in. It's kind of like "What causes the weather to change?" Lots of people have theories, but few have ever proved anything. I think for the purposes of this letter I'll stick to my thoughts on external or non-ballistic causes, and leave the internal and external ballistics side for another time.

One of the first things that comes to mind in this regard is the "missed condition." This generally occurs when shooting with only one eye open. Obviously, the cure is to keep both the scope eye and the other eye open when shooting. That way you avoid missing a condition change that occurs between the time you verify the condition, and the moment you actually squeeze the trigger. For some, this is not an easy technique to learn, but experience has taught me that mastering it can lead to a lot less 4 shot groups.

The rear sand bag and its care and handling is another cause of the "what the hell happened there" syndrome. I'm not at all sure I have the answer to this problem, but will offer a few observations.

Most of us tend to over manipulate the rear bag. This is especially true when going from the sighter to the record target and back up. I know I often squeeze the heck out of the bag in a hurried moment, and I'm convinced this does not do me any good at all. I think we have all done something similar to this. You're on the record target and have one shot left to finish a great group, (you know the one that will get you Small Group and some of the cash option money) the range officer has just announced that you have 15 seconds left and the condition you're shooting has suddenly gone away — you give the rear bag a hard squeeze and go back to the sighter — the shot tells you to hold off a bullet hole to the right — back to the record target with 3 seconds left on the clock you squeeze off the last shot — pushing the gun back forward you peek through the scope only to discover the shot hit 2 bullet holes to the right. I can't swear to it, but in my heart I just know that flyer was partially caused by me mishandling the bag.

Continued on next page

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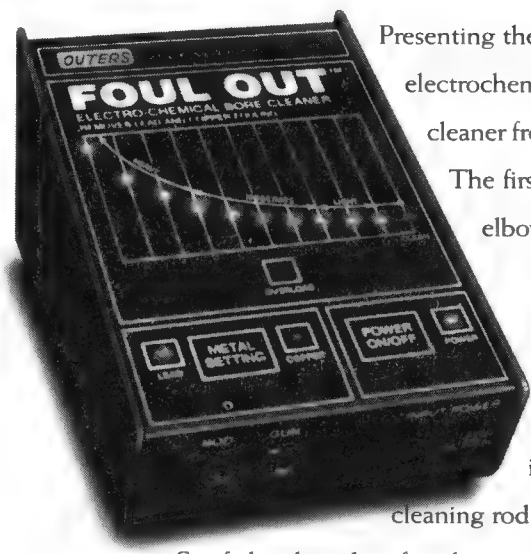

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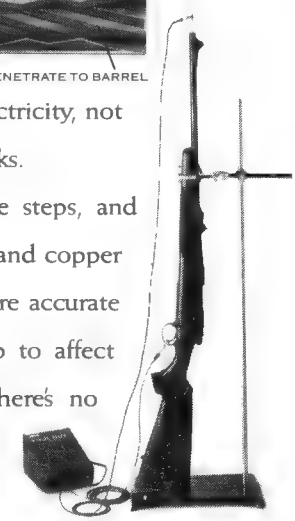

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THE FLYER

Continued

The proper amount of sand to put in the ears of the rear bag is another subject that tends to give me fits. I use a rabbit ear bag and have the ears filled with just enough sand so that when I tap the gun down so the bottom of the stock rides on the top of the bag, the ears are compressed to a moderate firmness. Experimenting with other amounts of sand in the ears has led me to believe that this may be the proper way to set up the rear bag, but it's not something I'd bet the farm on.

How we set up the rear bag is another point that may cause us some problems. It's my feeling that a lot of care must be taken to align the front and rear bag with the target. This is something that a lot of shooters I've watched seem to pay too little attention to. Also, during the course of fire many seem to be knocking the bag left and right and twisting it after each shot. I'm as guilty as the next guy for doing this, and I know it hurts my scores. With the current rules regarding rear bags, I don't really know the answer to this problem. What we really need is a bag that will stay put. Joe Vinci used to spit on the bottom of his bag and then slam it down on the bench. I haven't tried this technique yet, but who knows . . . Joe may just be a man ahead of his time? Getting the front bag to level the gun is another thing to consider in avoiding the unexplained flyer. Jerry Masker wrote a good article on this in PS not too long ago. I'm not sure I understood all the mathematical theory in his paper, but I learned enough to realize that a cockeyed cross hair can bring you to your knees in a hurry.

Well, I've rambled on long enough. Thanks for the opportunity to share my thoughts. Am looking forward to reading what some of the other fellas have to say.

Best regards,
Norm Dixon

WILBUR BAUER

Dear John,

Thanks for the opportunity to contribute to Precision Shooting magazine.

With all the gunsmith talent that is around today, I find it hard to always blame flyers on mechanical problems. 90% of all flyers come from shooter error, not malfunctioning equipment.

I'm talking about making a .180″ group into a 1.972″ group at 100 yards and a .209″ into a 3.509″ at 200 yards, I did this once at Crumlin and again at Reed's Run.

I had borrowed a scope from my buddy Larry Estes and was quick to blame it. Of course, it wasn't the scope. It was me. I just could not accept the fact that I shot that sloppy.

After some investigation, I realized I was getting off the gun too quickly and reaching for another round. This is a bad habit to get into. Since then I have tried to pause after pulling the trigger, and follow through with the shot, like a bowler following through with his arm.

You hear guys say, "That shot shouldn't be that far out of my group, there wasn't any condition change." Well, something changed. Maybe it wasn't the condition! That only leaves one other possibility, the shooter did something differently, maybe he slapped the trigger, flinched, shouldered the buttstock, etc. . . . he did something differently.

If you're out practicing some day and shooting little "bug holes," remember what you are doing and keep practicing those techniques. If you do run into a problem, ask another shooter to watch you shoot and look for inconsistencies in your technique. It works.

Believe me, when you are shooting good all day long and you make one mental error in the last match it makes you feel like double death hanging from a eucalyptus tree. Consistency wins matches.

John, hope this helps someone. Keep up the good work!

Willie Bauer

JAMES BOETTCHER

Definition of a flyer: a shot that falls outside the group that can not be explained by condition or hold.

BARRELS — Not all barrels are created equal. Even though barrelmakers strive to give us the very best they can, some just shoot better than others. Tony Boyer's essay on barrels entitled "Boyer Talks About Rifle Barrels" (P.S., Aug '87) covers this subject quite well. I highly recommend that new shooters read it.

There are some barrels that will never agg below .300″ in good conditions, even a dead calm. I know this for a fact. When you get one of these just take it off, put it away, and forget about it. That is the best advice I can give anyone on the subject.

CLEANING PROCEDURES — Are you keeping the barrel clean? How many shots between cleanings? Some barrels will shoot 9 or 10 shots then throw one, some do it after 6. This is totally unacceptable. You can not compete with 1 fouler and 5 record shots. Even the one that gives you 10 shots is marginal. A good 6mm barrel should be capable of putting 20 down range without any noticeable loss of accuracy.

Fouling is what causes flyers in a good barrel. How much? Depends; I feel it's worth approximately .50″. Bad barrels, hard to say, it's only a .300″ barrel on a good day, who cares?

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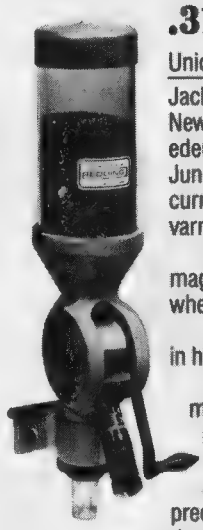

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BULLETS — Not all bullets are created equal. Quality or jacket lot number, determines the "shootability" of a bullet. You should only use quality bullets from makers who use the finest dies and components.

In the bullet making process, the core seating and lube steps are the most important. Remember, with bullets, like anything else, you can only make "one alike." The closer you can make the other 4,999 out of 5000 the better you will do on the line.

I'm fortunate to have two bulletmakers as friends, Ed Watson and Lowell Hottenstein. Both know more about bullet making than I do, therefore I buy them from them. Their ability to make uniform bullets is amazing.

PRIMERS — Some brands are better than others, some lots are better than others. Chronographs were developed to assist us in making these determinations. I use Federal's 205 match primers exclusively and have never had a problem with them. I've used other brands, but have not had quite the same results with them as I do with Federal's.

CASES — I use Sako .220 Russian cases right out of the bag. I set the shoulder back .040″, turn the neck to the desired thickness, load them up, seat the bullet firmly into the lands, and fire form them in an old barrel. (The chamber of which was made with the same reamer, of course!) I then deburr the flash hole, and uniform the primer pocket before the second firing. This procedure prevents "ring around the collar," or better known as the "donut."

If you have cases that have the donut ring on them, try shooting them with boatail bullets. Do not use them with bullets that would result in a tight fit in the chamber neck area. This will certainly cause flyers. Look for that bright ring on the case neck, it is a sure indicator of brass that is too tight in the chamber. This is the result of brass flowing forward and increased the neck diameter.

SCOPE — Our weakest link in the system. If you're experiencing problems, switch to a scope of known reliability. If still in doubt, send the scope back to the manufacturer and ask them to look it over for you. Don't fool around with a scope that you suspect has problems. Confidence in your equipment is a must.

TRIGGERS — They're sneaky. They can and do get dirty. Keep them clean! Also, they do wear out. I replaced three last year with Jewell's. Believe me, Jewell is the correct name for them. They are jewells.

FINAL COMMENTS — Spend twice the time practicing and shooting matches. Spend half the time screwing around with brass and the load. You will learn more at one two day match by shooting, watching, and asking questions than you will practicing by yourself for a year of Saturdays.

John, thanks for asking for my opinion. Hope this helps.

Jim Boettcher

BRIAN RUBRIGHT

Thanks for including me in your list of "experts." The subject you have chosen is one that I truly think we learn about through the "School of Hard Knocks." Some of the things that have plagued me through the years are listed below.

1. The seating die stem coming loose and changing the seating depth of the bullet.
2. Not checking the stock for bedding problems, glue-in's included.
3. A bad scope. This will drive a sane person "nuts."
4. Not checking your powder measure or different lots of powder.
5. Inconsistent shoulder pressure when holding the rifle.
6. Not taking the time to clean the barrel properly. I think this has caused many a sleepless night.

There is one area that I think we all overlook when we enter the game. If you would purchase your own reamer it would make things easier for you with respect to equipment consistency. Too many shooters have different barrels chambered by different gunsmiths. This creates confusion when working up loads for all these different barrels and chambers. I hope this offers some help to those new shooters you are trying to reach.

Regards,
Brian J. Rubright

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RECYCLING PPC BRASS AND SOME HISTORY

JOHN J. GAMMUTO

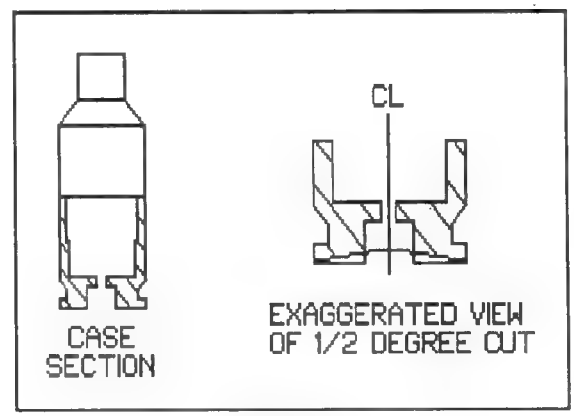

FIGURE 1.

There must be thousands, maybe even tens of thousands of used pieces of PPC brass with .220 Russian head stamps neatly bagged, labeled, and stored under loading benches all around the country. If you were smart enough to have saved some of your old brass, are willing to make a small investment, and willing to do a little work, you may be pleasantly surprised by what you are about to read.

In the days when .220 Russian cartridges were plentiful and moderately priced, benchrest shooters would retire their match brass more frequently than they do today. There were those who would prepare new brass when the cartridges would get a little tight in the chamber. Some shooters, whose names will remain anonymous, would dump their loading blocks after just one day on the firing line; they must have been shooting some pretty warm loads for this to become a necessity. Say what you will about balloon head case design, the old Russian cases held up remarkably well considering the above.

Full length sizing was generally regarded to be detrimental to accuracy and therefore not popularly employed. The lyrics, "Those were the days my friends, we thought they'd never end . . ." seem to testify to the fact that everything is subject to change. To verify this, all you need do is visit any benchrest tournament. You'll see many things being done differently these days. Loading presses, for example, have regained favor. Everything from the very lightweight and highly portable models to the full scale varieties are being used to size necks, set shoulders back, squeeze bases, and yes, full length size tight cases. As of yet, I don't know anyone that is seating bullets with anything other than a hand type seating die.

The presses marketed by RCBS, Lee, Forster/Bonanza, Redding, and Huntington all seem to be enjoying a fair measure of acceptance, with the edge going to RCBS and their new "Partner Press." The majority of threaded dies used in these presses still come from shops like Custom Products and Hammond's Rifles.

Neil Jones of Custom Products tells me that his threaded die business has experienced an upsurge recently due to the expanded use of loading presses. If you have a custom rifle built by Clarence Hammond, he highly recommends that you order a set of his chamber-mated dies, both hand and threaded varieties are available.

PPC shooters panicked more than a year ago when it became known that the more **commercially acceptable** PPC-USA cartridge would be replacing the .220 Russian. Those that had not laid in a goodly supply got very nervous, hoarding began, and case life took on a whole new dimension. Consequently, .220 Russian cases have **almost** become worth their weight in gold. Many shooters today only retire .220 Russian cases when they are no longer capable of holding primers, and only then. This is a far cry from the way things used to be.

Several fellas have been experimenting with case life extension techniques, while others have been attempting to work with all manners of 7.62 x 39 cartridges hoping to come up with something to rival the now legendary .220 Russian based PPC cartridge. There is no doubt that Pindell & Palmisano knew what they were doing when they selected the Russian case to be the foundation of their experiments and ultimate success.

A good number of shooters have switched over to the standard 6BR, or a variation thereof. The shortened-up version seems to hold the most promise. This is my third season of experience with a BR, and I believe it will be my most successful. The first two years I shot a 6BR with a 45 degree shoulder. It was very similar to Ferris Pindell's original design. The bolt handle got difficult to manage, a little tighter than I prefer anyway, so I put it to rest. This year I had Fred Hasecuster chamber me up what he calls a Talldog. It shoots very well and is the reason for my wide eyed optimism this season.

It seems funny now to look back at the days when all we had to do was call our local supplier and order up 100, 200, or 500 of those match winning .220 Russian cases; and yet, I seem to remember a lot of grumbling going on in those days. With every new lot there was always talk about quality control issues, soft brass, weight variations, wall thickness problems, etc. I only wish I had a couple of hundred thousand of those **substandard** cases to sell in today's market. I'll bet I could sell them out in less than a month! Wonder if Donald Trump or Kenny Gilbert have any?

I had better get to the point and explain how you can reclaim some of those loose primer pocketed .220 Russian based PPC cases before you get bored and turn to the Trading Post section.

Several fellas, as mentioned earlier, have been experimenting with case life extension. By this I mean modifying the base of a loose primer pocketed case so that it will once again be capable of firmly holding a primer. I first got wind of this procedure from my buddy Alvin Davidson of Las Cruces, NM.

Although Alvin says he has retired from the machining business, and has turned the business over to his capable son John, I suspect it is difficult for him to stay away from there. After all, that's where the machines are. You don't turn your life's work off in a couple a months, or even years. So, Alvin is still thinking and creating, but without the constraints of **having** to do anything. Needless to say, I envy him a lot.

Alvin told me that as far as he knew three fellas had been experimenting along these lines prior to his involvement: Dean Parker from Salt Lake City and Cecil Tucker and Flash Ebert from the Midland, Texas, area. They identified a need and took it upon themselves to do something about it.

Firmly believing that a picture is worth a thousand words, I offer the following for your consideration. This article must be close to a thousand words long, now look at my attachment (Figure 1.) Need I say more? Maybe a few more words would be required to supplement the drawing, and make things clear for you, but it certainly wouldn't come anywhere near what you have had to endure thus far. Right? Hey, when I got

space to fill I'm gonna fill it! Even if it means forcing my slanted perspective of benchrest history on you to make a point.

What the fellas have successfully managed to do is call back into service cases that most of us would have thought useless in years past. This is accomplished by simply cutting a one 1/2 degree crown in the base of the cartridge, starting in the center, and working to the outside edge of the base. Then all you do is reload and fire them. The void in the base of the cartridge, created by the removal of brass, allows the brass to flow downward into that area and tighten up the primer pocket. Some fellas have fired these reworked cases as many as 20 to 30 times with no depreciable loosening of the pocket.

If you are fortunate enough to have access to a machine shop and can grind a mill end, you're in business. If not, you're going to have to do one of the following. Purchase a new cutter for your Wilson case length trimmer and have someone grind it down a 1/2 degree for you, or convince someone like Fred Sinclair it would make a nice addition to his fine line of accuracy related components. I already beat you to this of course. By the time this article goes to press I wouldn't be surprised to learn that Fred had already sold a hundred of them.

Hopefully this news has brought a few smiles to some faces, stimulated some thought, and has testified to the tenacity of the American benchrest shooter.

John J. Gammuto

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Richard W. Kayser

David,

Some thoughts about the Oehler Ballistic Explorer (BEX) that I have been playing with for the past couple of months. I have put a number of people in front of the computer and said "try this". All of them have been able to run the BEX within 5 minutes of turning the computer on. This thing is beyond even your ability to screw up! ANYBODY can work BEX that can "hunt and peck" type, and put the piece of paper in the printer right side up.

After Buddy's article on the Proware BP I thought the readers might like to hear about one that requires absolutely no computer expertise to work properly. Just type, and you have it. I am looking at the Proware to see if it is as technical and recalcitrant as the rumors floating out of Morehead would have us believe.

Boyd and the Old Fart are coming over in about three weeks for a Chuck Shikari (if sod poodles are a safari, then the King of Varmints deserves a shikari title), and Dick Cundiff and Lee Meadows are also converging on the Carey area. It will be the "Woodstock" of chuck hunting. Lemme see, where did I put my Nehru jacket and Paisley bell bottom slacks?

Enjoy.

RWK

PS: I am in the final stages of case design on the 6mm/.257 Banshee. Will get you a reamer print as soon as Keith Francis gets it to me. Add ½" in case length to Boyd's .240 Badger is a rough idea.

BALLISTICS PROGRAMS, PART III
OEHLER'S BALLISTIC EXPLORER

Dave,

Me again . . . or should that be me still? I read with a great deal of interest Bud Salyer's review of the Proware ballistics program. I have been working with Ken Oehler's Ballistic Explorer for awhile, and am very pleased with it. It is the least intimidating of the half-dozen or so I have played with (or have tried to play with, some of them do not respond to un-computer people like me). According to Ken Oehler (it is pronounced Ayler) "the program can compute bullet path, energy, momentum, time (of flight), velocity, and wind deflection, as they are influenced by ballistic coefficient, muzzle velocity, sight height and/or adjustment, bullet weight, altitude, temperature, wind, and slope. It will provide all of this data with color screen graphs and printed tables, and in less time than it took to read this." I have taken the liberty of printing out the basic images You see on the screen when the BEX (Oehler's name) is running on the computer monitor, and the printouts you can get.

Printout 1 is the way the screen looks when you start up. Look at the second line, the one with File, Help, etc. on it. To work out a ballistic program just push E for enter, and put the information in the slots (BEX calls them Trace Parameters) listed. By using the first letter of each command, the BEX makes it easier for people who do not have much computer experience to get the data. Looking at the three Traces you can tell I used the .257 Roberts with three bullets at velocities I get, and some range information.

To generate the data, I entered my figures, Pushed C to calculate the values, and P to print the downrange numbers sheet (Print Out 2). Anybody can get any of the BEX's functions to work, it's that simple.

Print Out 2 is the standard data printout. I think the most interesting figures are the comparative bullet Wind Drifts, and Path numbers. All three bullets are zeroed at 400yds, but the wind drift and drop at 1,000 are real eye openers. The remaining velocity and bullet energy are a little surprising too. The 75gr data gives the same performance as 55gr bullets at 3900fps in the .220 Swift are supposed to out to 500 yards as far as drop and wind are concerned.

Print Outs 3 and 4 are the Comparative Graphs you can view by pushing the G key. There is also a crosshair that can be cen-

Continued on page 28

```
                    Ballistic Explorer: Main
File    Help    Enter    Scale    Calculate    View    Graph    Print    Quit

                          Scale: 1000 Yds
Trace 1  257Rbts75grHP | Trace 2  257Rbts100grBT | Trace 3  257Rbts120grBT
Find: Sight Adj (MOA)  | Find: Sight Adj (MOA)  | Find: Sight Adj (MOA)
  Ballistic Coef: 0.302|   Ballistic Coef: 0.393#|   Ballistic Coef: 0.435#
  Muzzle Velocity: 3700|   Muzzle Velocity: 3200#|   Muzzle Velocity: 3000#
 Sight Adj (MOA): 6.7  |  Sight Adj (MOA): 8.3   |  Sight Adj (MOA): 9.3
     Zeroed Range: 400 |      Zeroed Range: 400 # |     Zeroed Range: 400 #
  Vital Zone Size: 3   |   Vital Zone Size: 3    |   Vital Zone Size: 3
    Bullet Weight: 75  |     Bullet Weight: 100 # |     Bullet Weight: 120 #
   Altitude (Ft): 4000 |    Altitude (Ft): 4000 # |    Altitude (Ft): 4000 #
 Temperature (°F): 85  |  Temperature (°F): 85  # |  Temperature (°F): 85  #
Pressure (in Hg): 29.53|Pressure (in Hg): 29.53#|Pressure (in Hg): 29.53#
 Cross Wind (MPH): 10  |  Cross Wind (MPH): 10  # |  Cross Wind (MPH): 10  #
Range Slope (Deg): 0   |Range Slope (Deg): 0    # |Range Slope (Deg): 0    #
Sight Height (in): 1.5 |Sight Height (in): 1.5  # |Sight Height (in): 1.5  #
Coef. Based On: Metro  |Coef. Based On: Metro    |Coef. Based On: Metro
 Method: Siacci        | Method: Siacci          | Method: Siacci
```

Trace 1: 257Rbts75grHP Bullet Weight (G): 75 Range Slope (Deg): 0
Method: Siacci Altitude (Ft): 4000 Sight Height (in): 1.5
Ball. Coef.: 0.302 (Metro) Temperature (F): 85 1st LOS Crossing: 22
Sight Adj. (MOA): 6.7 Pressure (in Hg): 29.53
Zeroed Range: 400 Cross Wind (MPH): 10

Range Yards	Velocity F/S	Energy Ft-Lb	Momentum Lb-Ft/S	TOF Seconds	Drop Inches	Path Inches	Drift Inches
0	3700	2280	39.64	0.0000	0.00	-1.50	0.00
100	3358	1878	35.98	0.0851	-1.35	4.17	0.71
200	3042	1542	32.60	0.1792	-5.76	6.79	2.99
300	2748	1258	29.44	0.2833	-13.89	5.67	7.04
400	2472	1018	26.48	0.3985	-26.58	0.00	13.06
500	2212	815	23.70	0.5270	-44.98	-11.38	21.40
600	1967	645	21.08	0.6714	-70.70	-30.08	32.54
700	1741	505	18.65	0.8335	-105.68	-58.04	46.81
800	1535	392	16.44	1.0173	-152.99	-98.33	64.89
900	1351	304	14.47	1.2264	-216.57	-154.88	87.41
1000	1206	242	12.92	1.4585	-299.84	-231.13	113.99

Trace 2: 257Rbts100grBT Bullet Weight (G): 100 Range Slope (Deg): 0
Method: Siacci Altitude (Ft): 4000 Sight Height (in): 1.5
Ball. Coef.: 0.393 (Metro) Temperature (F): 85 1st LOS Crossing: 18
Sight Adj. (MOA): 8.3 Pressure (in Hg): 29.53
Zeroed Range: 400 Cross Wind (MPH): 10

Range Yards	Velocity F/S	Energy Ft-Lb	Momentum Lb-Ft/S	TOF Seconds	Drop Inches	Path Inches	Drift Inches
0	3200	2274	45.71	0.0000	0.00	-1.50	0.00
100	2964	1951	42.34	0.0975	-1.78	5.45	0.67
200	2740	1668	39.14	0.2030	-7.50	8.46	2.73
300	2527	1418	36.10	0.3172	-17.79	6.90	6.33
400	2324	1199	33.20	0.4409	-33.41	-0.00	11.60
500	2130	1008	30.43	0.5765	-55.56	-13.42	18.96
600	1944	839	27.77	0.7240	-85.28	-34.41	28.42
700	1770	696	25.28	0.8859	-124.40	-64.80	40.42
800	1608	574	22.97	1.0651	-175.39	-107.06	55.46
900	1456	471	20.81	1.2611	-240.05	-163.00	73.46
1000	1324	389	18.92	1.4777	-322.61	-236.83	95.07

Trace 3: 257Rbts120grBT Bullet Weight (G): 120 Range Slope (Deg): 0
Method: Siacci Altitude (Ft): 4000 Sight Height (in): 1.5
Ball. Coef.: 0.435 (Metro) Temperature (F): 85 1st LOS Crossing: 16
Sight Adj. (MOA): 9.3 Pressure (in Hg): 29.53
Zeroed Range: 400 Cross Wind (MPH): 10

Range Yards	Velocity F/S	Energy Ft-Lb	Momentum Lb-Ft/S	TOF Seconds	Drop Inches	Path Inches	Drift Inches
0	3000	2399	51.43	0.0000	0.00	-1.50	0.00
100	2796	2083	47.93	0.1038	-2.02	6.21	0.66
200	2600	1802	44.58	0.2155	-8.48	9.47	2.73
300	2413	1552	41.37	0.3350	-19.96	7.73	6.16
400	2234	1330	38.30	0.4647	-37.42	-0.00	11.38
500	2063	1134	35.36	0.6048	-61.78	-14.63	18.45
600	1897	959	32.52	0.7561	-94.12	-37.24	27.48
700	1742	809	29.87	0.9222	-136.62	-70.01	39.11
800	1597	680	27.38	1.1033	-190.99	-114.65	53.37
900	1461	569	25.04	1.2997	-259.09	-173.03	70.34
1000	1340	478	22.97	1.5147	-344.78	-248.98	90.58

tered on a plotted point by moving the arrows around to see the exact yardage and trajectory number(s) for a particular load. I put it at 500yds and the numbers appear in the upper right hand box on printout 4.

Back to Print Out 1, and the places to input your own load data. I used the three Traces to show the different bullets, but you can use three different velocities, or plot the wind's effect, or altitude, or any of a host of variables. If you get into shooting cast bullets, the program can give you the ballistic coefficient by moving to the BC line, and pushing the ?. The screen then asks for two velocities with the bullet and the distance between them. Push the C key to calculate the BC and put it in it's space on the Trace Parameter. It can take the data you feed it, and calculate the sight adjustments necessary to zero at different ranges to .1 moa, or tell it your sight setting and it will tell you the zeroed range. It also figures the 1st LOS Crossing, which is the range the bullet first crosses over the line of sight on it's way to the target. If I want a 400 yard zero, but the range is only 200yds long, I can put the target at 22yds (see Pr2 75gr load) and zero with confidence that my loads are "on" at that distance. I checked this with the .257 Roberts, my .308 HC rifle, the '06, and several of the members of my Rod & Gun Club's hunting rifles at our range. It also worked within 2 inches with my cast bullet (1300fps) loads in a Ruger #1 .45-70 at 300 yards. It even works with muzzleloaders and round balls.

One of the more interesting figures the BEX provides is the CDFC graph, and numbers. CDFC stands for Combined Distance From Center, and illustrates the bullet's movement downrange. It seems that the combination of wind and the Bullet Path can move the bullet farther away from the target than either factor alone would account for. I think this is where Boyd Mace had his Problems with the "excessive" wind drift at long ranges. It is my opinion that the wind Drift Tables used in figuring drop exist in a controlled setting, not in the real world. Look at my chart on Print Out 2, and the Wind Drift print out. 21.40″ of calculated drift, but the CDFC graph shows a drift amount of 24″ at 500 yards. If you run CDFC at 1,000 yards the disparity is even greater 114″ vs 160″. I'd be very interested in the velocity data on Boyd's 6mm, to run it on BEX and see how close the C.D.F.C. figures would match the "excess" drift Boyd has encountered.

Oehler seems to be the only ballistics programmer curious about the anomalies that exist in the wind department. Now if I could only get him to come up with a program that would work on mirage!

The Ballistic Explorer from Oehler is the best of several I have had the chance to work with. It is simple to use, gives all the answers I need or want about what should be happening "out there" in front of the muzzle, and the nice folks at Oehler always have time to answer my questions about the BEX or chronographing. It's enough fun to justify buying a computer to run "what if" ballistic games on. It really is that easy to use.

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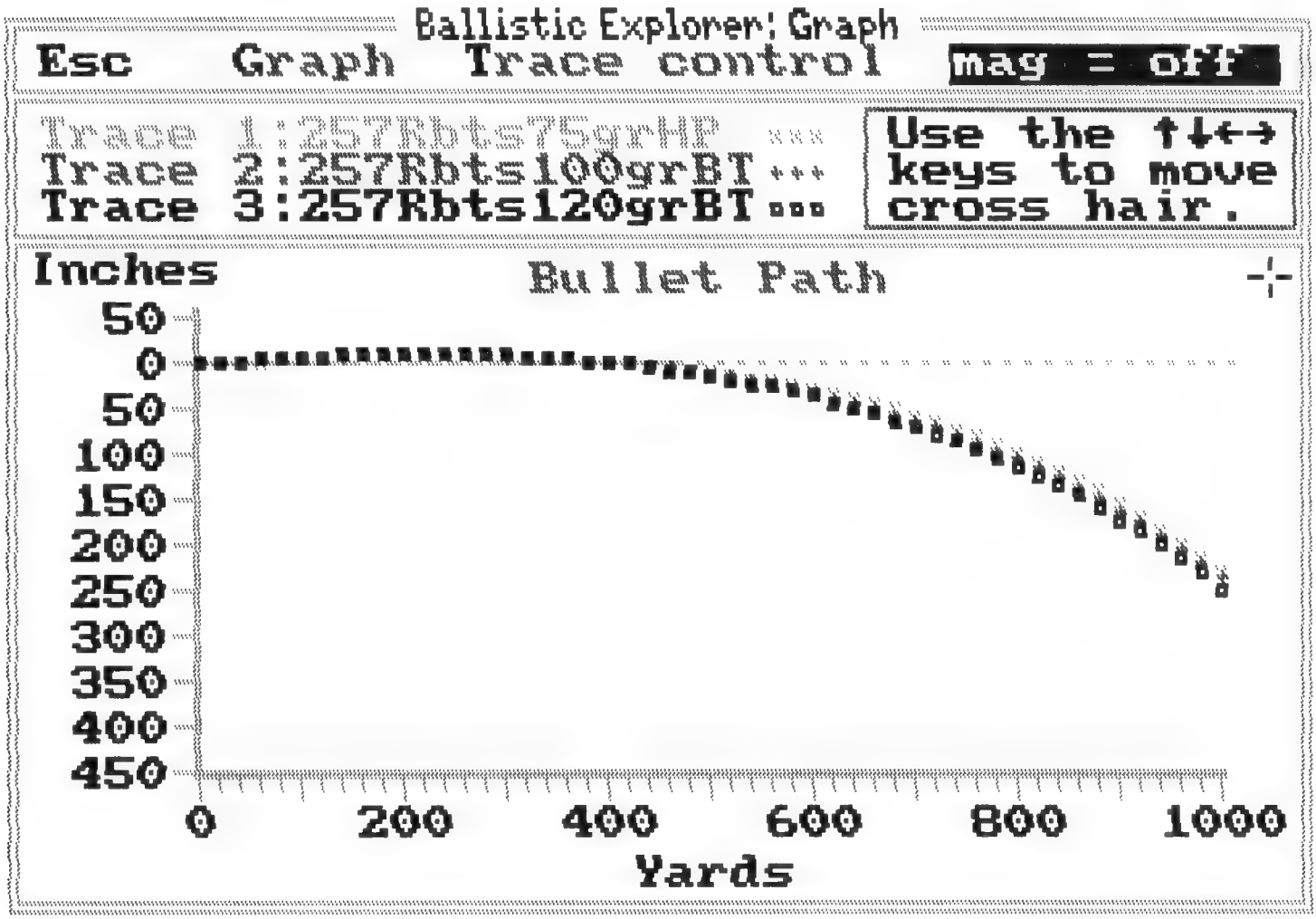

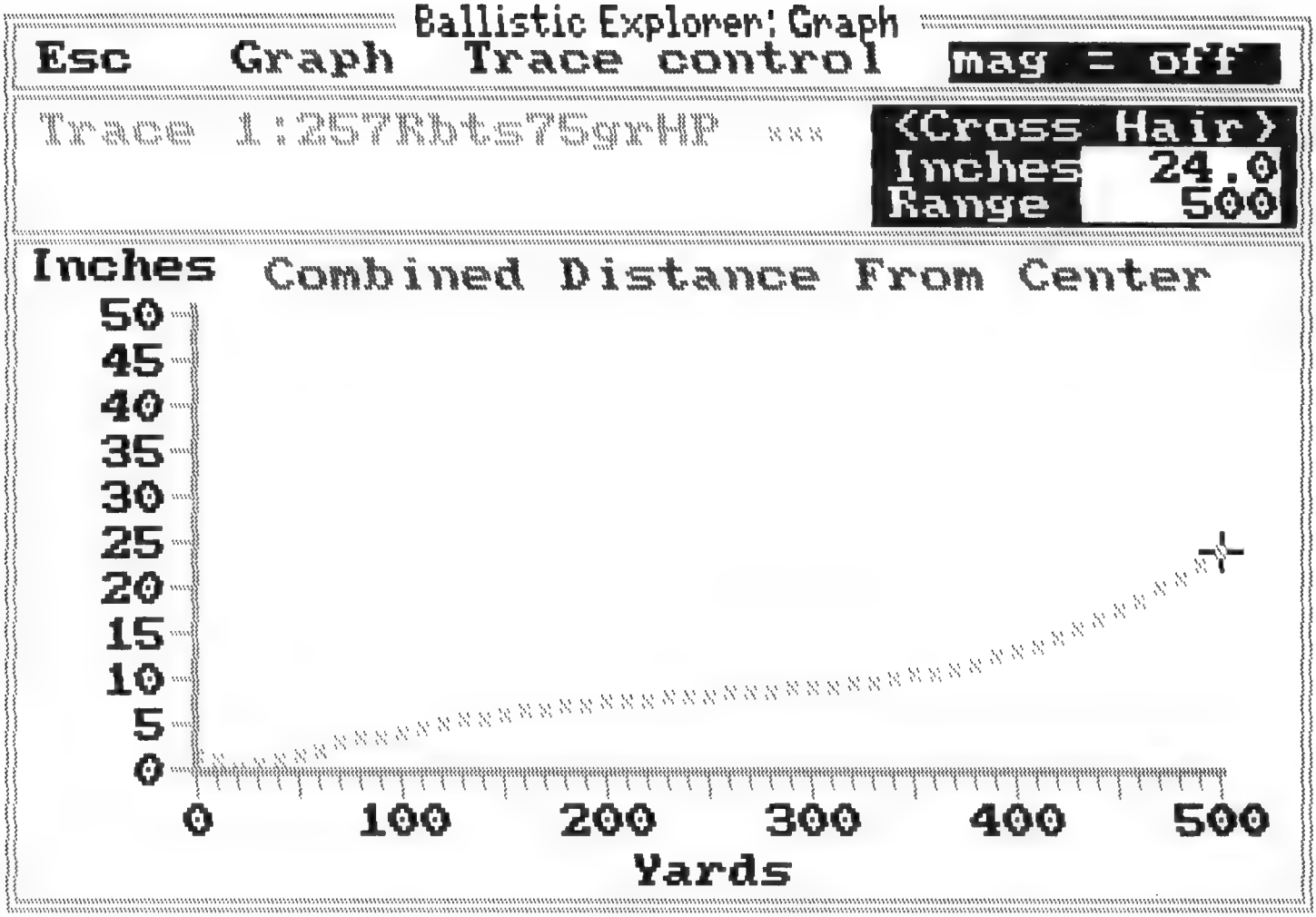

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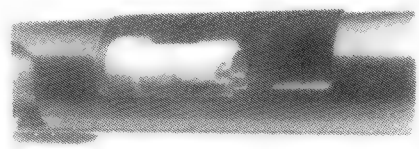

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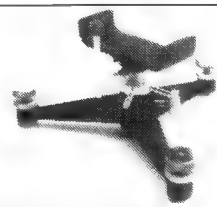

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MERRILL MARTIN

Dear Dave:

We spent the past two days in the basement pressure lapping a pair of 45/70's, a Ruger #1 and a replica Officer's Model Trap Door 1873 by Harrington & Richardson. After studying the range and ballistic tables in the back of Lyman's book on Cast Bullets, we decided that maybe the recoil of the large bullets wouldn't be too bad if kept around 1100-1200 FPS.

Lyman's Table gave me the clue for assembling a winning Coor's load in .30 Cal, namely pick a ballistic coefficient and velocity that would minimize wind drift at 200 yards at the low end of the velocity scale. Best compromise was around 1400 for the .30 Cal. The .45 Cal seems to give less drift with the lower ballistic coefficient at the lower velocities of 1100 FPS. We didn't need the very long and heavy 45 bullets as anticipated and projected from the .30 Cal experience.

Thus, the incentive to get one of the 45/70 rifles competitive by lapping. We have two #1 Rugers, one stock production under 9 lbs. with a scope and the other modified with a very heavy 28″ Douglas match barrel. Also, a couple of Trap Door Springfields, a replica and a real thing. What's most humbling is that the old original Springfield has the best and smoothest bore of the lot, and I don't intend lapping it unless it finishes last on the range against the other rifle. The bore scope shows that they had some pretty fine tooling and craftsmen over a hundred years ago. This old-timer hadn't been fired when I got it back in the 1940's with tools, powder and cases for $25.00. Guess my cleaning and care was good as the bore is spotless after hundreds of black powder rounds over the years.

Recently picked up a Lyman .458 124PB mold and, naturally, even before casting a single bullet had to modify it. Knew from experience what diameter it had to be bored in order to get a .459-.460 final cast size; so, into the lathe it went. After adjusting the diameter and eliminating one grease groove, we drilled it for the thermometer. Then, set the sprue plate up in the mill and cut a half round groove from where the edge of the cavity would come under the plate out to the edge of where the blocks would be. This groove was for venting gas and metal and to allow more metal to go into the main sprue hole. Referred to as a vent riser in foundry parlance. It really works as bullets come out several grains heavier no matter what technique or how you pour not using the riser groove. The riser shears off on the edge of the bullet base and doesn't affect shape or flatness. Since I also punch an index mark in the nose area of the mold and locate the bullet the same each firing, the riser wouldn't open a group, but the denser bullet definitely closes the group.

It's kind of neat weighing bullets out of a mold modified this way and controlling temperatures of both pot and mold. We discovered that it required the pot to be up to 900° and the mold up to 500° before this particular alloy would produce 400 grain bullets consistently, plus or minus .2 grain. Only about one in ten or twenty has to be tossed back in the pot as we cast.

It's going to be fun to see how these big things shoot for score as they don't have to group as tight for the same score as the .30 Cal. Working up a load on the chronograph and target on the basement 50′ range has been a real thumping good experience with bullets from 400 to over 600 grains in weight. It's amazing how these large projectiles can stabilize and go into practically one hole in this short distance. We now have over a half dozen loads ready for the longer outdoors distance that chrono in the 1100-1200 FPS range and have an Sd under 10 and groups in the .1″ area at 50′. Had to make a special .45 Reticle for this and targets to match. It is amazing how much can be accomplished indoors at short range. Of course, it's mostly eliminating the many bad combinations as only a few of the good basement loads are still tight at 100-200 yards, but the time saved driving to the longer ranges is considerable, plus not having to haul all the tools for adjusting things.

Yours truly,
Merrill D. Martin

P.S. Dave — You've probably wondered what happened to all my 30 Cal. GC projects, and why we are on to projectiles that hurt when you accidentally drop them on your foot.

We are waiting for confirmation that we may have set a new cast bullet record for light production rifle 10-shot 100 and 200 yard group aggregate. This is with a factory Rem 788 30/30 in which we reduced the modified choke pattern to full choke by pressure lapping. That little skinny barrel gun must really offend the died in the wool BR shooters with big bucks in their rigs, and it even had a Tasco scope! I must confess, Dave, at this stage of load research and development, I'm ready to place an order with a suitably recommended complete BR gunsmith for a 10 lb. properly put together bolt rifle and 24X scope, but chambered for the 30/30 x 2.000″ cartridge with a close neck and .056″ thick rim, 2 oz. trigger, etc. Stock, choice of gunsmith.

I don't have time to put it together myself. Don't know if I would like to compromise it and have a magazine for "hunter" bench, as at this stage I'm for flat out accuracy. If the gunsmith figures 12 lbs. is more reliable, then we will go for that class and weight. I need the help of the staff on this one and can afford what they come up with.

What say, Dave, any takers?

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Ye Olde Editor,

You aren't mad at me or anything are you? I mean, the Coors Regional in Tacoma was just a lark. I never thought anyone would recognize my name from the magazine, and request my participation in the Media/Celebrity Match. How was I to know that this Dave Purcell guy from California had won the last two Coors Tacoma Regionals, and had a red hot .32-40? I just sat behind the rifle and squeezed the 4 lb.(!) trigger when the flags drooped. I didn't plan to win the damn thing by 20-odd points, I just wanted to shoot a decent score. Now these people think I'm a real shooter. This Valuck chap from Coors even wants me to come out to Golden (Colo) in August for the Nationals.

I copied my target at work, it is a tidy 10 shot group with cast bullets at 200 yards. The wind doping will make you crazy, a 210gr .32 caliber cast bullet at 1400fps (est) does not buck wind very well. I am also sending a copy of the match report, you will note that Mr. Purcell's rifle shot even better with Mr. Purcell behind the butt. It is a Clerke Hi-Wall replica, with a Matco barrel chambered for the .32-40 case. Dave shot a 210gr spitzer shape bullet, from a Barnett mold. Breechseated, in front of WW296 powder. Dave has won the Tacoma Regional three years running now, and finished 7th at the Nationals in '88 and '89.

Can we puleeeeze get the following information in the June issue?

1. The .257″ Banshee Reamer Print. I have been getting mail about the mystery case. Based on the RWS 6.5X68 case.
2. Hard data on the 2 .257″ LoDrag bullets. The 88gr model is .930″ long, 9 caliber ogive flatbase will work great with a 14″ twist. Ballistic Coefficient of .540 at 3200fps.

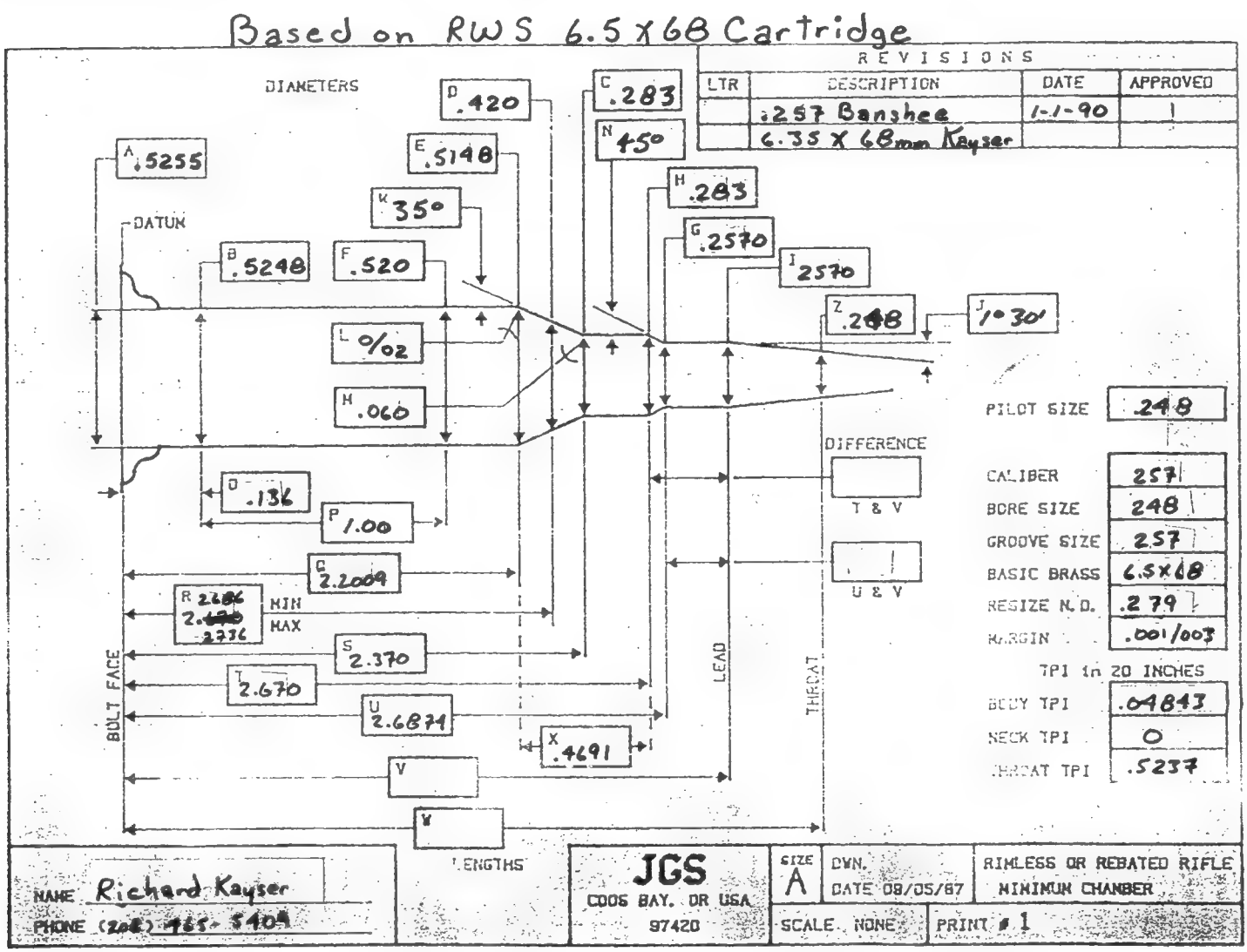
The 115gr model is 1.190″ long, 15 caliber ogive BT. Ballistic Coefficient is 567 at 3200fps. Will work well in a 10″ twist.

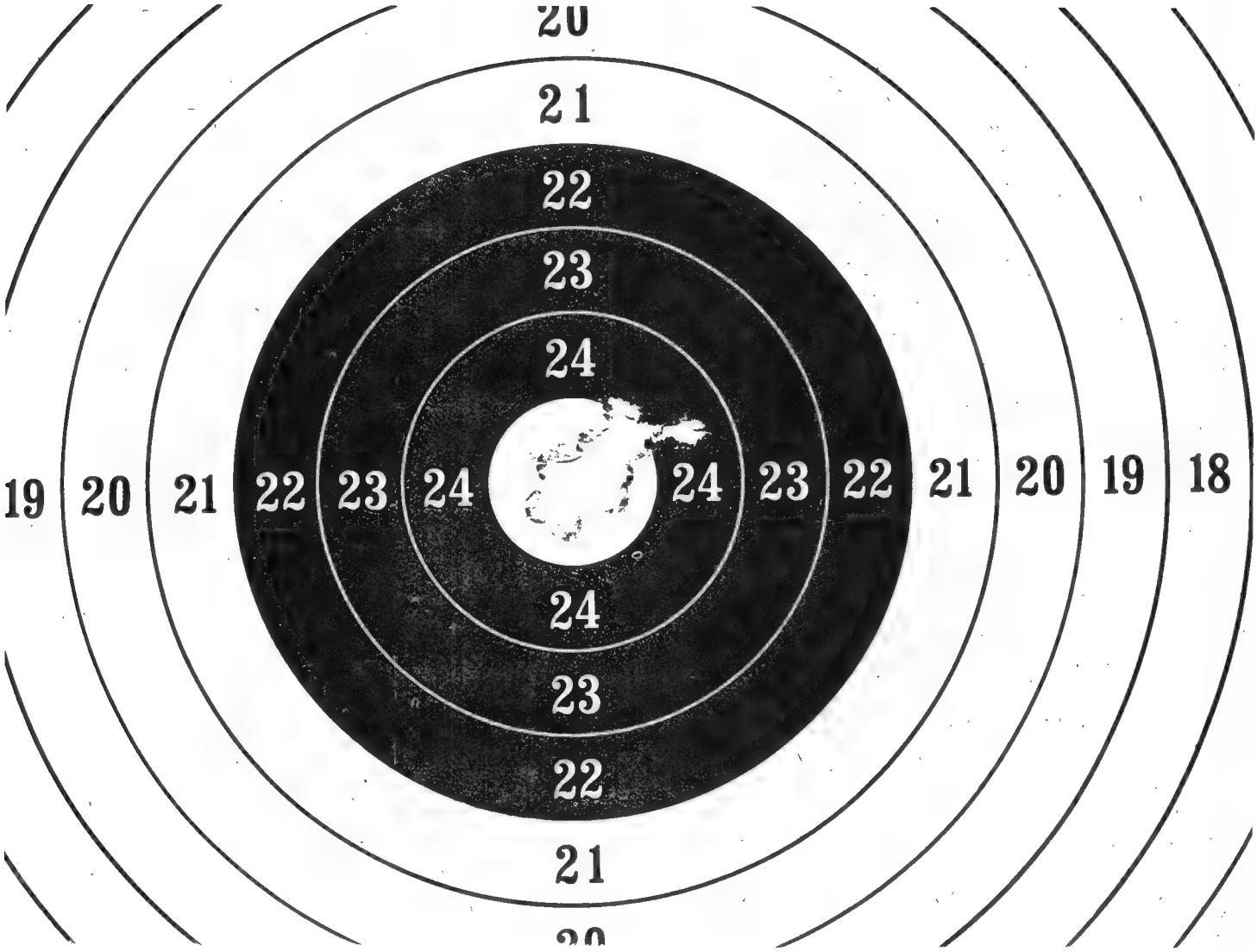
Thank you Sir
Rich

PS The Coors people want to know if we want a booth at the Nats? I would man it over that weekend, except for the hour for the media/celebrity match. Spread the gospel (according to Mrs. Brennan's boy Dave!) amongst the benighted heathens, so to speak.

RWK

Bill Davis, Dr. "P", and several other folks are agog over the 6.5 case. It would make a superb base for wildcatting ⬆⬇, especially shortened for 100% density loading. .002″ or less runout on the case.





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CREIGHTON AUDETTE

To answer A. B. Bailey's letter, printed in Merrill Martin's section in the May issue, perhaps it is best to start with the earliest breech loaders, the problem of sealing off powder gases, and the solutions arrived at, over time.

The earliest breech loading cannon, of 2″ to 3″ bore size, were made prior to 1380. The bore wall was cut away at the breech to permit insertion of a separate, handled, chamber piece, which looked something like a beer mug and held the powder and shot. After loading the chamber piece, a wedge was driven in between its rear end and a supporting wall, which was integral with the barrel. Henry VIII had a breech loading, wheellock, arquebus in the early 1500's, which functioned on somewhat similar principles. It is now in the Tower of London. The difficulty with these, and other types of early breech loaders was the impossibility of adequately sealing off the escape of powder gases. Work on this problem continued until practical and effective solutions were found in the latter part of the 1800's.

The earliest of these, applied to breech loading cannon, were various types of cups, of steel, or of copper, placed into the breech behind the charge and in front of the breech closing mechanism. They came into use in the late 1850's and were invented by French ordnance engineers, Beaulieu and de Reffye. In 1863, Krupp adopted the "Broadwell Ring" system, invented in England, for his improved breech loading cannon. These mechanisms were given the name "obturators", from the Latin word "obturatus" — closed. They were not very effective and tended to leak after a few shots had been fired. However, they can well be classed as the first step towards the metallic, cartridge case, the idea being sound and the failure being one of technology in materials and manufacturing processes.

In 1872 Captain de Bange of the French Army devised his "plastic gas check", which was a sucess and used in breech loading cannon loaded with bagged charges of powder through WW II and perhaps even now, in some of the largest cannon. The illustration, Figure 1, is from Hayes "Elements of Ordnance", published in 1938. The best description of its principles I have found is in the book "Naval Gun", by Hogg and Batchelor and the following is taken from it.

"When the gun was fired, the chamber pressure forced the mushroom head back; this placed pressure on the pad and squeezed it outwards to seal against the chamber wall and inwards to seal against the mushroom bolt. This is fairly obvious; what is perhaps less obvious is that there is a very subtle interplay of forces at work, which is best explained by taking some hypothetical figures. Suppose the front surface of the mushroom head to be 10 square inches and the chamber pressure of the gun to be 20 tons per square inch. This means that there is a force of 200 tons pressing back on the mushroom head and being transmitted to the pad. But, since the pad has a hole in the center, through which the bolt passes, and since the bolt is not delivering pressure, it follows that the area of the pad in contact with the rear of the mushroom head is sensibly less than 10 square inches; if we say that this reduced area is eight square inches, this means that the 200 ton pressure results in the pad pressure being 25 tons per square inch. This, in turn, means that the outward pressure of the pad against the chamber walls (and on the spindle of the mushroom bolt) will always be greater than the chamber pressure, so that there is an ample factor of safety in the design."

Typically, de Bange obturators are used in screw breech systems and, as is evident

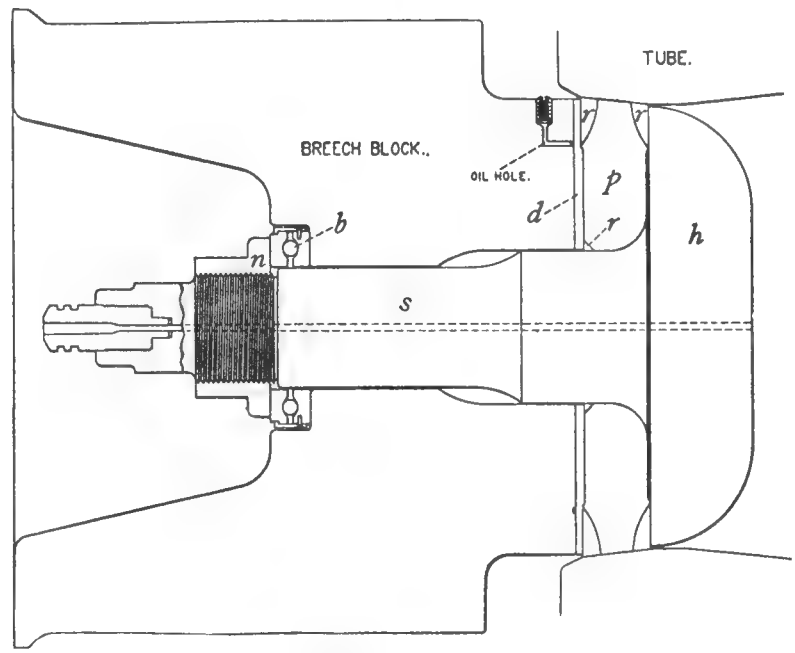

Figure 1. Cross Section Of de Bange Obturator
The obturator consists of the steel mushroom head h with the spindle s, the pad p, the steel split rings r, and the steel filling-in disk d. Section s is called a spindle by Hayes and a bolt in "Naval Gun."

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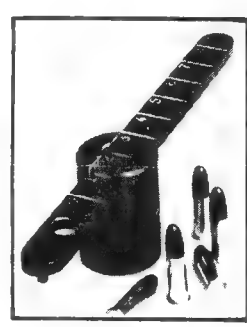

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from the illustration, when the breech is fully closed, the, pad p, is squeezed by the taper at the edge of the chamber, giving it a compression preload. The term "plastic", as applied to this obturator, refers to a substance capable of easy deformation, and the term is apt, since p is made "from asbestos, tallow, and paraffin or other substance, that together form a plastic mixture that melts only at a high heat. The ingredients are mixed and then pressed into shape under a hydraulic press and protected by a cover made of canvas or of asbestos wire cloth." (Hayes).

The sealing effect of the de Bange obturator is the result of a pre-loaded sealing member, plastic or deformable, which, in use, is loaded dynamically, to exert a unit sealing pressure greater than the unit pressure of the gas which is being sealed. Reference to a handbook on seals and packings, or to the sections describing them in a technical volume, such as Marks "Standard Handbook for Mechanical Engineers" or to "The Tool Engineers Handbook" will show a great many different designs of seals and

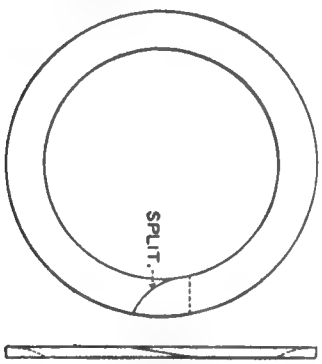

Figure 2. Steel Split Rings
These rings are hardened, and their outer surfaces, which are coned towards the front, are very carefully ground, so that their diameters when the rings are free are .010″ larger than the diameters of the conical seat in the bore. The edges of the rings therefore always bear against the wall of the bore. The smaller split ring surrounding the spindle, as shown in Figure 1, serves to prevent escape of the pad composition between the filling in disc and the spindle. (Hayes)

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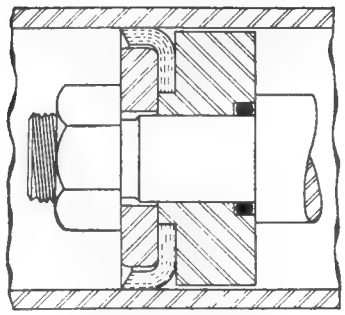

Figure 3. Cup Seal

packings which use the same principles as the de Bange obturator.

What is probably the oldest seal, whose basic design is still used in a great many applications, is the cup packing, shown in Figure 3. It was likely that its first use was in hand operated, reciprocating, water pumps, centuries ago. Its principle is the basis for the metallic cartridge case, so it is relevant to our discussion. In this case, the cup is shown in use in a single acting cylinder. The outer diameter of the cup, held to the piston by the washer and nut, is lightly loaded against the cylinder wall by its diameter and resiliency, but there is an opening between the washer and the inner wall of the cup. When the pressure of the gas or fluid on the cup side of the piston is increased, there will be a tendency towards leakage between the outer diameter of the cup and the cylinder wall. Actual leakage will be a function of the cup preload against the wall, size and geometry of the mating surfaces, and surface finish. Since the pressure on the rod side of the cup is lower, the result will be a pressure gradient over the length of cup contact with the cylinder wall, high on the cup side and low on the rod side. In part, this results from friction losses as fluid seeps through the joint. The inside diameter of the cup, however, is exposed to the full pressure for its full length. At some point in the length (or height, if that is a better term) the pressure inside the cup will be greater than the pressure outside, forcing the cup against the cylinder wall with a unit pressure sufficient to seal off leakage.

Mr. Bailey fully understands this, as he wrote a very clear explanation in his letter of Feb. 9, 1988 to Merrill Martin and Merrill sent me a copy of it.

A metallic, cartridge case is a cup with a thin walled, forward end, usually made of copper, or copper alloy. Steel cartridge cases have been used successfully, but the mechanical characteristics of steel makes it less desirable than brass for this use. Obviously, the case must be smaller in diameter than the chamber, or it could not be easily inserted or removed, and the neck, shoulder and forward area of the case body are often .005″ to .010″ smaller in diameter than the mating chamber areas in typical rifle calibers. Initially, during firing, the powder gases will leak back past the outside of the case neck and some of it gets past the case and into the action, as is clearly evident from the residues that are found on bolt faces and breech blocks and inside the actions of firearms. As in the piston cup, there will be a pressure gradient along the outside of the case. Bailey used the term "pressure distribution is approximately triangular—." As the gas pressure rises, the pressure inside the case will, at some point near the neck, exceed the pressure outside the case, expanding the thin area at the neck and shoulder and sealing off the gas leakage. This is evident from the blackening by powder gases of the neck and shoulder area of fired cases in many rifle calibers. The low pressure, crimp and relatively stiffness of .22 rimfire cases results in gas leakage, pushing powder residue and grease from the case into the action and requiring cleaning, from

Continued on next page

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CREIGHTON AUDETTE

Continued

time to time, as most shooters have observed. The cup of a primer serves the same function as a seal and gas marks on bolt faces are common in highpower calibers.

To consider the claim of both Merrill and Bailey that the P wad is a controlled fluid, let us examine the O-Ring, an exquisite seal design, which functions as a controlled fluid. Probably 99% of PS readers are familiar with O-Rings, but, for those that are not, see Figure 4. An O-Ring is made from an "elastomer." Used to seal off gases and liquids, it is usually installed in a groove in one of the mating members. The successful use of an O-Ring depends on machining the groove to the geometry, tolerances, and surface finishes specified by the manufacturers . A cross section of an O-Ring, as installed and as under pressure, is shown in Figures 5 and 6. These drawings are copied from the "Parker O-Ring Handbook", which describes an elastomer "as a material exhibiting little plastic flow and quick and nearly complete recovery from an extending force." Further, "it must meet the following requirements in order to be called an elastomer.

A. It must not break when stretched approximately 100%.

B. After being stretched 100%, held for 5 minutes and then released, it must retract to within 10% of its original length within 5 minutes of release."

The Handbook includes information on the surface finish required for the sealing surfaces, 16 microinches, for gas, and remarks about the deleterious effects of "machining scratches that cut across the O-Ring."

Merrill has referred to the polyethylene used in P wads as an elastomer, but it clearly does not meet the above specifications. It is easily permanently deformed, as shown

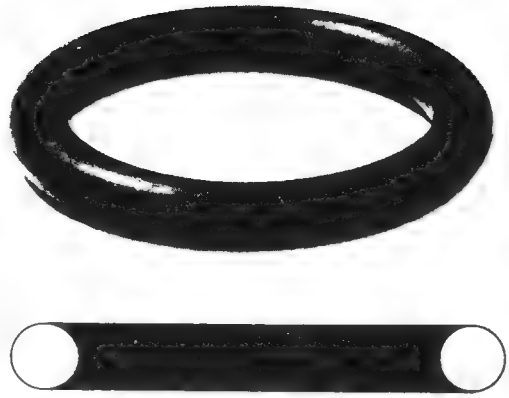

Figure 4. O-Ring

by the rifling marks on his fired wads and by one which I fired, which impacted the lettering on the forward sky screen of my chronograph, producing a permanent reverse configuration of the lettering. I have a wadcutter that cuts 1/16″ thick polyethylene to produce a wad about .314″ to .315″ diameter. Pushed through a short, throated section of .30 caliber barrel and measured immediately, the diameter is about .312″ to .313″. It will return to approximately the original diameter in a couple minutes, but the rifling land marks are permanently impressed. Placed between the flat, ground surface jaws of a small, milling machine vise and squeezed, it comes out permanently deformed, about half the original thickness and with a correspondingly larger surface.

Parker describes the O-Ring as "an incompressible, viscous fluid having a very high surface tension. Now, whether by mechanical pressure from the surrounding structure or whether by pressure transmitted through hydraulic fluid, this extremely viscous fluid (The O-Ring.) is forced to flow in the gland to produce a positive block to the flow of the less viscous fluid being sealed. (A gas is a "less viscous fluid", technically.) Note that the O-Ring is mechanically squeezed out of round between the inner and outer members to close the fluid passage. The seal material under mechanical pressure exudes into the micro fine grooves (machining scratches) of the gland." See Figure 4, which shows an O-Ring assembled in a unit.

Figure 5 shows an O-Ring under pressure. The Handbook states: "Note that the O-Ring has been forced to flow up, but not into the escape passage and in so doing has gained a greater area and force of sealing contact.", i.e., the angle on the side of the groove forces the ring towards the mating member. It is obvious that the curved section of the O-Ring towards the pressure side is greater in area than the areas which are flattened against the side of the groove and the mating surface. The principle involved is precisely the same as in the de Bange obturator and in other, successful seals: a preload, to provide enough sealing pressure to resist leakage prior to application of system pressure and an area exposed to full pressure which exceeds the area of contact of the sealing surfaces. This produces a unit sealing pressure higher than the unit pressure of the contained fluid. In this case, the sealing member is a "controlled fluid", an elastomer, which will instantly return to its assembled shape if the pressure is removed and resume its original shape almost completely, if removed from the assembly.

A polyethylene O-Ring would fail because of creep and plastic flow, under pressures where an elastomer O-Ring would function with ease. Simply left in an assembled condition, creep would result in loss of most of the initial sealing pressure. Under load, the sealing surfaces would be subjected to a higher unit pressure and plastic flow would occur in these areas until the unit pressure on sealing surfaces and fluid surfaces nearly equalized, resulting in a roughly triangular shape. The combined areas of the sealing surfaces would then be greater than the pressure surface, breaching the requirements of a successful seal.

In an article some time ago in PS, I mentioned my involvement in work on a single shot, 45 mm cannon, where it was desired to reach 6000 fps muzzle velocity for test purposes. For development purposes, it was necessary to prove that the 45 mm projectile would penetrate the armor at the nose of an incoming, short range, ship to ship or ship to shore missile. The armor varies in thickness and is thickest at the nose. The design specifications of the finished weapons system were a full automatic, radar and computer controlled cannon, with a muzzle velocity of 3500 to 3600 fps, a velocity easily reached with current technology. In use, the velocity of the cannon projectile would be augmented by the incoming

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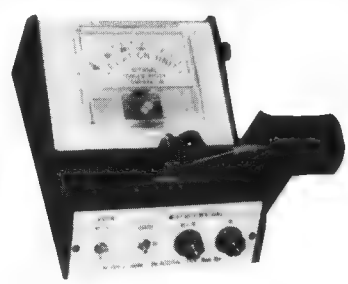

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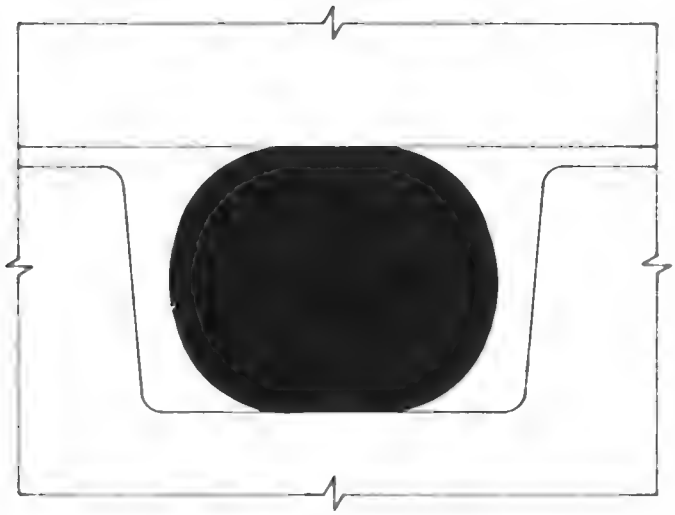

Figure 5. O-Ring, as installed.

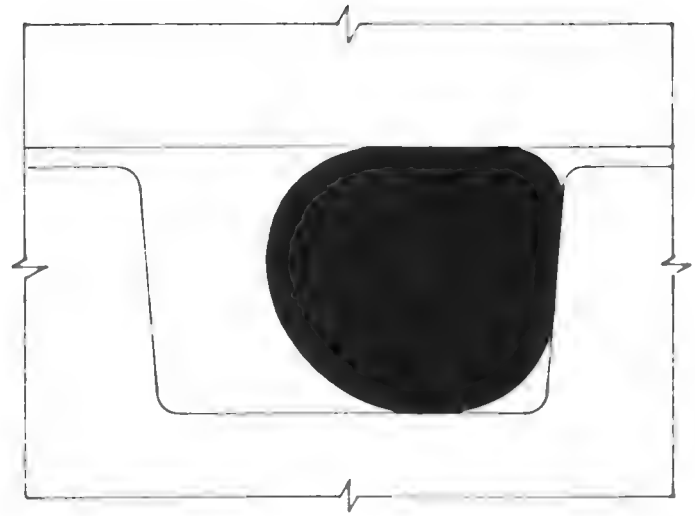

Figure 5. O-Ring, under pressure.

Photo 6.

missile velocity on shots requiring nose penetration. The test firing had to be done on a stationery missile, mounted on a pedestal, which necessitated the need for the high velocity gun. A muzzle velocity of 5600 fps was attained at a peak, chamber pressure of about 90,000 psi., resulting in shot penetration of the thickest part of the armor on a missile, detonating the high explosive and producing a shock wave having 18000 fps velocity. The high speed movies taken of the test were spectacular!

The single shot, test cannon in Photo 6 had a barrel 11 feet long, which was mounted so it could slide in recoil against hydraulic shock absorbers. It was desired to be able to change chamber dimensions, if necessary for test purposes, so the chamber was a separate section, flange bolted to the breech end of the barrel, as shown in the photo. The gun was instrumented for taking gas pressures at the chamber and muzzle and producing a pressure-time curve. Firing was done through chronograph screens. There was no cartridge case and powder was loaded in a bag into the chamber. This

Continued on next page

CREIGHTON AUDETTE

Continued

necessitated a seal in the face of the breech block, Photo 7. The flanged joint between chamber and barrel was designed to be preloaded in compression by the bolts to a force exceeding the highest chamber pressure, but a seal was included in this joint as an extra precaution. The fellow in Photo 6 is the engineer in charge of the project, who did the design work and selected the seals.

I designed and made the breech block and firing mechanism shown in Photo 8. A .30-40 Krag case, charged with black powder, was used as an ignitor for the main charge. This was loaded into the breech block by unscrewing the bolt, the section behind the breech block. The spring loaded, cross member on the bolt section is the cocking handle and the sear was released electrically by the solenoid on the back end.

A high pressure, metallic seal was placed in the groove in the face of the breech block. It was roughly C-shaped shaped in cross section and thicker than the groove depth, so screwing the breech block home preloaded the seal across the vertical section of the C, leaving the opening towards the inside diameter of the groove, as the mating surfaces of block and chamber came together. Upon firing, gas pressure inside the C created a higher unit pressure on those surfaces on the outside of the C coming in contact with the groove and mating member, as per usual seal design. The huge, hex socket wrench leaning against one side of a section of the base weldment was used on the hex of the breech block to screw it home, preloading the joint between block and chamber. The preload was insufficient to prevent some gas leakage across the face of the bolt, but the seals worked well. Subjected to very high stresses, they were replaced at each shot.

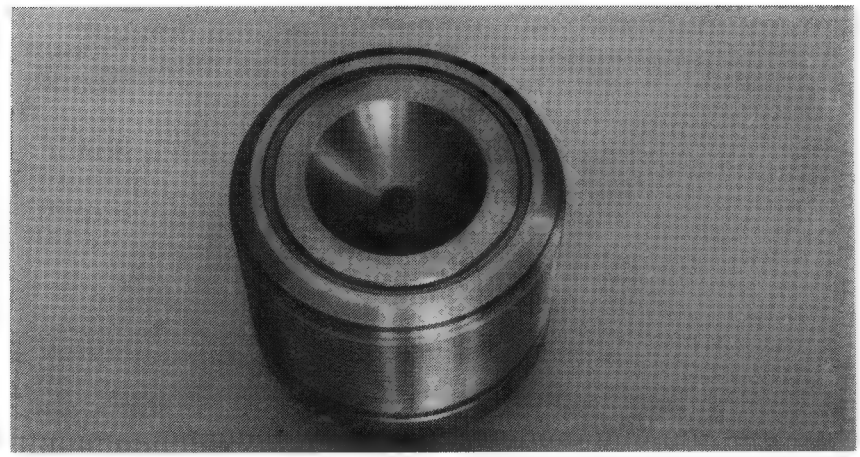

Photo 7. Face of breech block.

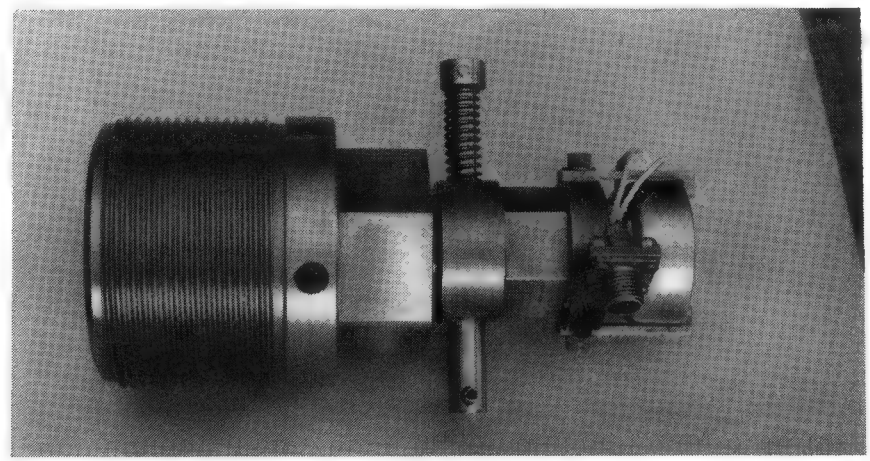

Photo 8. Breech block, bolt and firing mechanism, assembled.

The engineer's calculations indicated an average, maximum, chamber pressure of about 90,000 psi would be needed to reach the desired velocity. This meant that the case head could be expected to extrude to fill any available space around the head and trouble with punctured primers could be expected. The firing pin was only 1/16″ in diameter, had only .001″ clearance in the hole, was separate from the striker and held in place by a hollow nut behind a flange on the pin, which prevented the point from being forced back any further than just below the bolt face, in order to provide maximum support to the primer.

Photos 9 and 10 show fired and unfired cases. The fired primer is not pierced, it looks that way due to lighting. In early firing, we discovered that a new case would be vaporized at the front end, as shown, during firing. The black powder pressure, without a bullet in the case neck, would not expand the neck sufficiently. When the hot gases of the main charge came back into the breech under high pressure, the forward case end was not positioned against the chamber wall of the breech block, resulting in vaporization. This was solved by fire forming the cases in an old, .30 caliber barrel, cut with the same reamer used to chamber the breech block, previous to their use in the cannon.

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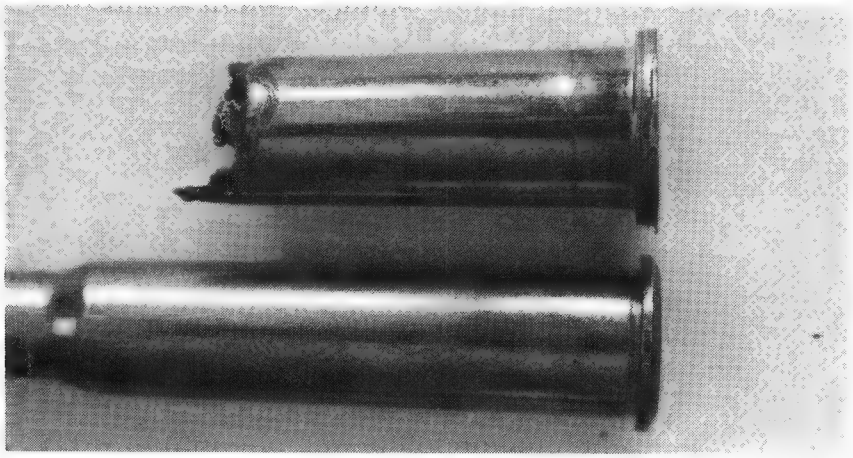

Photo 9. Side View, fired and unfired .30-40 Krag cases.

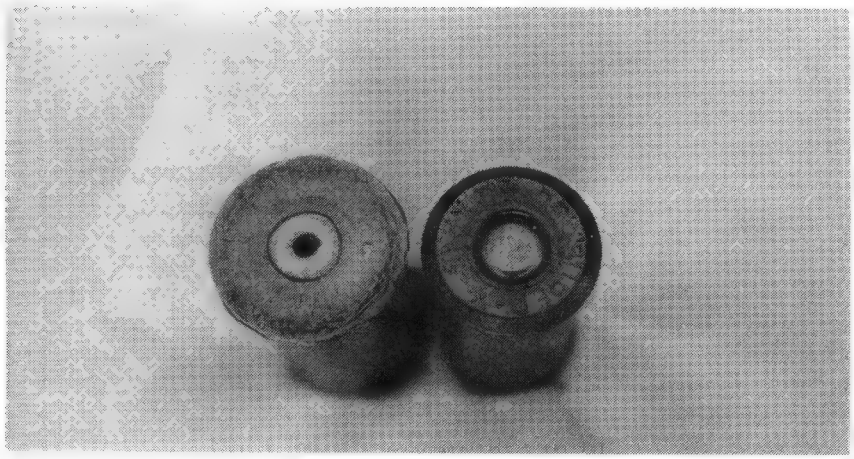

Photo 10. Heads of fired and unfired .30-40 Krag cases.

Merrill Martin and Bailey have both claimed that the P wad is a "controlled fluid", during firing, and that this characteristic provides sufficient sealing pressure against the rifle bore during firing. It seems to me that the above discussion of O-Ring function refutes the idea of the P wad as a "controlled fluid", but let's see what would happen, if it were. For discussion of its potential sealing properties, let us assume that it is actually a fluid, contained in a hydraulic cylinder with a closed end, and subjected to pressure by a piston at the open end. It is commonly understood that the fluid, under such conditions, exerts an equal unit pressure, normal to the contact surface, in all directions. If the pressure of the piston is 2000 psi, the pressure against the side walls and opposite end of the cylinder is also 2000 psi. Therefore a thin, flat wad, of **any** material cannot fulfill one of the fundamental requirements of a successful seal, i.e., that the unit sealing pressure must be greater than the unit pressure of the fluid to be contained.

My recollection is that in the early stages of his experiments, Merrill stated that the P wad **must** be .001″ larger than the groove diameter. After a couple years he changed this to .002″. The wad is loaded into a case neck which must be of smaller inside diameter than the wad. It is difficult to load the wad, then seat a bullet, and be certain that there is no air space between wad and bullet

Continued on next page

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CREIGHTON AUDETTE

Continued

base and that the wad is not cocked. If the bullet base comes close to the start of the case shoulder, trapped air may force the wad through the neck and leave it loose in the case.

At ignition, pressure inside the case is atmospheric and when it increases to overcome inertia and bullet engraving forces, it moves the wad past the the gap at the end of the case neck, some .020″ to .030″ larger in diameter than the wad and, depending on the chamber and case dimensions, perhaps as much as .035″ wide, into a throat area whose large end, at the rear, is larger in diameter than the wad. It is probable that the gas pressure at this time is less than the compressive yield strength of the wad and, even if it is not, it seems highly likely that there will be gas leakage around the edge of the wad, which cannot conform to the changing dimensions and geometry involved. Once leakage starts, the wad edge at the point of leakage is subjected to the same pressure as the powder gas pressure behind the wad. Sealing off the leaking gas requires a pressure between wad and bore which is higher than gas pressure, as is clearly evident from the designs cited above and from numerous designs which utilize wedge members, Vee members, etc., found in textbooks. The P wad cannot function as an effective seal, used as it is, for this reason. It cannot conform to the grooves and lands in corners to seal off gas at high pressure and given the surface finish and lay common to rifled bores it is unlikely to seal off gases on the grooves, sides of the lands and tops of the lands. Nor is it likely that any flat, thin wad, made of a true elastomer would do so, under the conditions in a rifled bore. Anyone who has worked with hydraulic equipment, operating at 1000 or 2000 psi, is fully aware of the problem of hydraulic fluid leakage. Change that to a gas, at 20,000 to 40,000 psi, in a system which involves translation of one part of the sealing mechanism and leakage is inevitable in a construction like a rifle barrel.

Gaskets are also discussed in textbook chapters on seals and packings and consideration of the requirements for a successful gasket will, I think, throw some light on the probable efficiency of a P wad, loaded into a case behind a lead bullet and fired down a rifled barrel. The following is quoted from "Marks Handbook": "The proper design of a gasketed joint requires flange rigidity to avoid bowing, surface finish commensurate with gasket type and fluid pressure, and adequate bolt loading. The load must seat the gasket, i.e., cause the material to flow into and fill flange irregularities. It must also carry the fluid load with sufficient excess so the residual pressure on the gasket exceeds the fluid pressure."

It is probable that the most scientific investigative work on cast bullets ever done in the U.S. was the work of Col. E. H. Harrison, a career officer in the U.S. Ordnance Dept., and a long time experimenter with lead bullets. His work was published at various times from the late 1950's into the late 1970's, in the "American Rifleman" and included in the NRA handbook, "Cast Bullets." The following is quoted from an article that appeared in March 1958: "It might be expected that wads would be useful to protect the bullet from hot powder gases. The experience during this investigation was that most do little to protect the bullet and grease wads have very little lubricating effect. Wads generally appeared to have a slightly unfavorable effect on grouping. There is little case neck below a seated bullet (sometimes none at all) to hold a wad. ---- eventual failure of the bullet occurs not from powder gas heat but from plastic deformation of the bullet under pressure, for which no wad of practicable thickness gives any help." Col. Harrison settled on the use of Dacron fibre, which obviously is not a seal, but which seems to do anything polyethylene wads can do, is easier to obtain, costs less, is easier to use, is not subject to the damage sustained by the wads in passing into the throat, does'nt tilt in passage down the barrel, and is less likely to be acclerated by the muzzle blast into a balance-upsetting contact with the bullet base, at exit from the muzzle.

Photo 11 will probably mystify many readers of PS, but it is included here for a purpose which will be explained later. It seems to me that Bailey's calculations regarding the P wad are, possibly, based on faulty assumptions. His technical education and knowledge are undoubtedly better than mine, however, my career included some 36 years in industry, involved in the manufacture of machine tools, plastics injection molding machines and magnetic memory devices, in a number of positions from apprentice machinist to an assistant division manager. I spent a number of years in the design of cutting tools, including gear shaper cutters; was a value analyst, working with both manufacturing and engineering; and a manager of manufacturing engineering. I have some knowledge in a wide range of subjects, but certainly not the depth I would like in many of them. I have kept all the technical books I acquired during this career, some useful handbooks, and have added others, as the years went by. I have some knowledge of springs, but do not have a copy of Wahl's "Mechanical Springs." I am aware of the Wahl Factor, used to calculate stresses in the design of helical springs. Not knowing more about Wahl's work, but assuming any spring design calculations would involve materials having spring characteristics, I would ask Bailey how these apply to a plastic, which is somewhat resilient, but subject to permanent deformation and creep under rather light loads, and does not have the the elasticity typical of spring materials.

Further, it seems to me, with my limited knowledge, that his calculations on the P wad fail to consider that the powder gas pressure behind the wad starts at atmospheric pressure, rises to a peak in perhaps an inch or two of bullet travel, then drops off rapidly; they also fail to consider the conditions of change in geometry encountered by the wad in its first 1/4″ to 1/2″ in travel, previously discussed; and that they are based on the assumption that the rear and front sides of the wad are subjected to the same pressure. It seems to me that his view of the P wad as a seal is based on the assumption that the side opposite the gas pressure is supported by a rigid, stationary surface, instead of a lead bullet in passage down the rifle bore; and that the wad, in some inexplicable manner, has already been subjected to a load sufficient to compress it, forcing the wad edge against the bore sufficient for sealing, before the gas pressure is applied, i.e., making it, in some unlikely manner, akin to a gasket.

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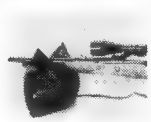

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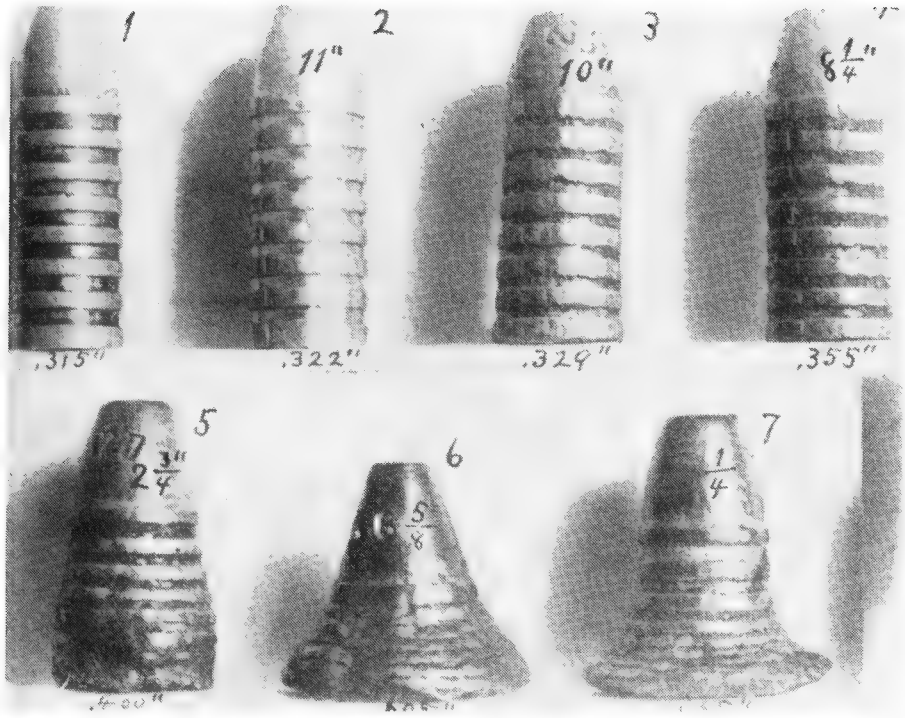

Photo 11. Illustration from Mann's book, "The Bullet's Flight from Powder to Target."

(This photo, although it was copied from the 1st edition of the book, is not too clear and I don't know if some of the necessary detail will reproduce in print. There should be enough of the bullet shapes left in print, but, if your printer thinks some of the numbers may not come out, here is the detail on those.

Bullet No.	Length of barrel	Expanded size of base.
1		.315″ (As cast.)
2	11″	.322″
3	10″	.329″
4	8¼″	.355″
5	2¾″	.420″
6	⅝″	.805″
7	¼″	.655″

Since the number information is significant, I suggest printing it, if there is any queston of legibility.)

To return to Photo 11: It is copied from Mann's "The Bullet's Flight from Powder to Target". The seven bullets shown were all cast of pure lead and were .315″ diameter, bore size, before firing. Fired with 45 grains of Fg black powder, they were breech seated fully into the rifling, before firing. Peak powder pressure of this load was probably about 18,000 to 20,000 psi. Bullet #1 is as cast. The others were fired in the same barrel, successively shortened from 11″ for #2 to 1/4″ for #7, as written on the bullets. The book is not clear as to how this length was measured, but I believe it was the length of the barrel ahead of the seated bullet, as this would make sense. Number 6 was fired from a barrel 5/8″ long, the figure to the left of this is an identification number, stamped on the bullet before loading. The figures at the bases are the diameters, as cast for #1, and after recovery, for the others. The diameter and shape to which each bullet was expanded by powder gas pressure as it left the muzzle gives a good picture of the stresses in each bullet at that barrel length. Bullet base diameters combined with barrel lengths give an idea of the shape of the pressure curve.

It is evident that the powder gas pressure must have exceeded the yield point of pure lead, in compression, for it to upset bullet bases as shown in these photos. Further, since the bullet nose was subjected to atmospheric pressure, plus the pressure required to move the air column ahead of the bullet in firing, while the base was subjected to powder gas pressure, there was a pressure or stress gradient the length of the bullet and this results in the tapered shapes, large end at the rear, where the stress was highest. While the bullet was constrained by the rifle bore the bullet could not expand, but the stresses existed in the bullet interior, to the extent that the bullet, in varying degrees, was in a state of plasticity. The resultant bullet upset, upon release from the constraint of the barrel, provides a very good picture of those stresses.

Therefore, it would seem, the P wad, a solid, not a "controlled fluid", if it were forced tight against the bullet base, and if it were actually a good seal, would also have a pressure or stress gradient in its thickness, which does not seem to be considered in Bailey's calculations.

If the lead bullet is plastic and it is forced against the bore as it must have been, from these pictures, why isn't it a seal? If it is a seal, what purpose does the P wad serve?

I have never seen any picture or description of a seal, used commercially, recommended in engineering textbooks, or offered for sale, which consisted of a flat thin wad of any material, one side exposed to pressure and the other backed up against a piston, which is the situation in the P wad. If Mr. Bailey has, I would like to have a photocopy.

For years, I have read the "ASSRA News", as a member of the American Single Shot Rifle Association; and "The Fouling Shot", as a member of the Cast Bullet Association; and have followed the reports of their matches and the loads and equipment used with some care, but I do not ever recall seeing any mention of the use of P wads by the match winners. If anyone out there knows of such use, please inform me.

When I was running the tests of pushing P wads, .314″ to .315″ in diameter, through a section of a Hart, .30 caliber barrel to find out what happened to the wad, I also ran another simple test. I turned up a couple rods to just slide through the bore and squared the ends in the lathe. One, short rod was inserted in one end of the barrel, which was then placed on the drill press table. A P wad was then pushed down firmly, to rest squarely against the short rod and the barrel filled with water, up to the throat. A second P wad was inserted in the throat and pressed down a short distance, using the drill press ram as a press, with the longer rod in the chuck. The rod was then lifted to make sure that P wad was square to the bore, then reinserted and the upper wad pressed down. Pushed slowly, or rammed down full force, the water simply squirted past the P wads at both ends. If the P wad cannot seal off water, at comparatively low pressure, how can it seal off powder gases at 20,000 to 40,000 psi?

Creighton Audette

The 6mm Banshee

Ye Olde Editor,

I guess I could go ahead and give you the background on the Banshee, as long as I have an open envelope and some time.

I am, as you know, a .257 caliber fan. The Roberts has always been a do-it-all cartridge for me: it harvest chucks out to 500 yards, it also provided one shot kills on several elk and mule deer, and one antelope over the past years. However, there is no competition for the VLD 6mm Walt Berger is making. The first Banshee will be a 6mm, but I hope to neck it up to .014″ by 1991. It all hinges on a .600+ BC bullet.

On to the 6mm Bansee aka Kayser. I have a friend witha 6.5X68 European model Weatherby, and in chronographing it alongside a 26″ M70 in .264 Magnum, I noticed that the 6.5 would give 100 fps increase over the .264 with same weight bullets. Unfortunately, the 6.5mm bullet selection is lacking in VLD-type bullets as well. I started running the VLD on my ballistics program, and when I got to 3600-3700 fps the numbers were outstanding to 1000 yards. Using the 3600 fps figure and different zero ranges, I got the balance at a 500 yard zero. As the enclosed Pro-Ware Ballistic Program chart shows, the trajectory is very workable on a rockchuck (4-5″ wide, 12-16″ tall) sized target, out to the 1000 yard range . . . perhaps a bit farther if you have the skills of a Boyd Mace. The problem, then, was to find a way to boost the VLD to that stratospheric level, and maintain the 1/4 moa that the .240 Badger achieves. I called Walt Berger to see about ordering bullets, and find out if the VLD would take the rotational forces of 3700 fps in a 9″ twist. He thinks it will work in a 9.5″ twist at 3600 or more fps, and give the accuracy if pressures do not skyrocket. Now all I needed was a case with the powder capacity to provide the added velocity I wanted. Thumbing through the Hornady 3rd edition manual, I found the 8mmX68S cartridge. 2.7″ long, .524″ at the base, what if . . . ? Blow the case out, move the shoulder out and sharpen it to 35 degrees, then neck it down to 6mm. A rough calculation shows the increased volume of the case at 85 gr, a 25 gr increase over the .240 Badger. If a slow-enough burning powder could be found, 3700 fps might be found.

I have a reamer on order from JGS, brass enroute from The Old West Scrounger, bullets on order from Berger, a 700 LA and sleeve, and I am negotiating with Dan Lilja on the barrel and work. Dies are a minor irritation, but I think I have the problem solved for now. With some luck, a working 6mm Banshee could be in the field in late May. It will be a most puissant entry in the varmint wars. I will have updates, and a full report, as things happen. A reamer print is enclosed for your perusal, as are initial downrange performance data.

Rich Kayser
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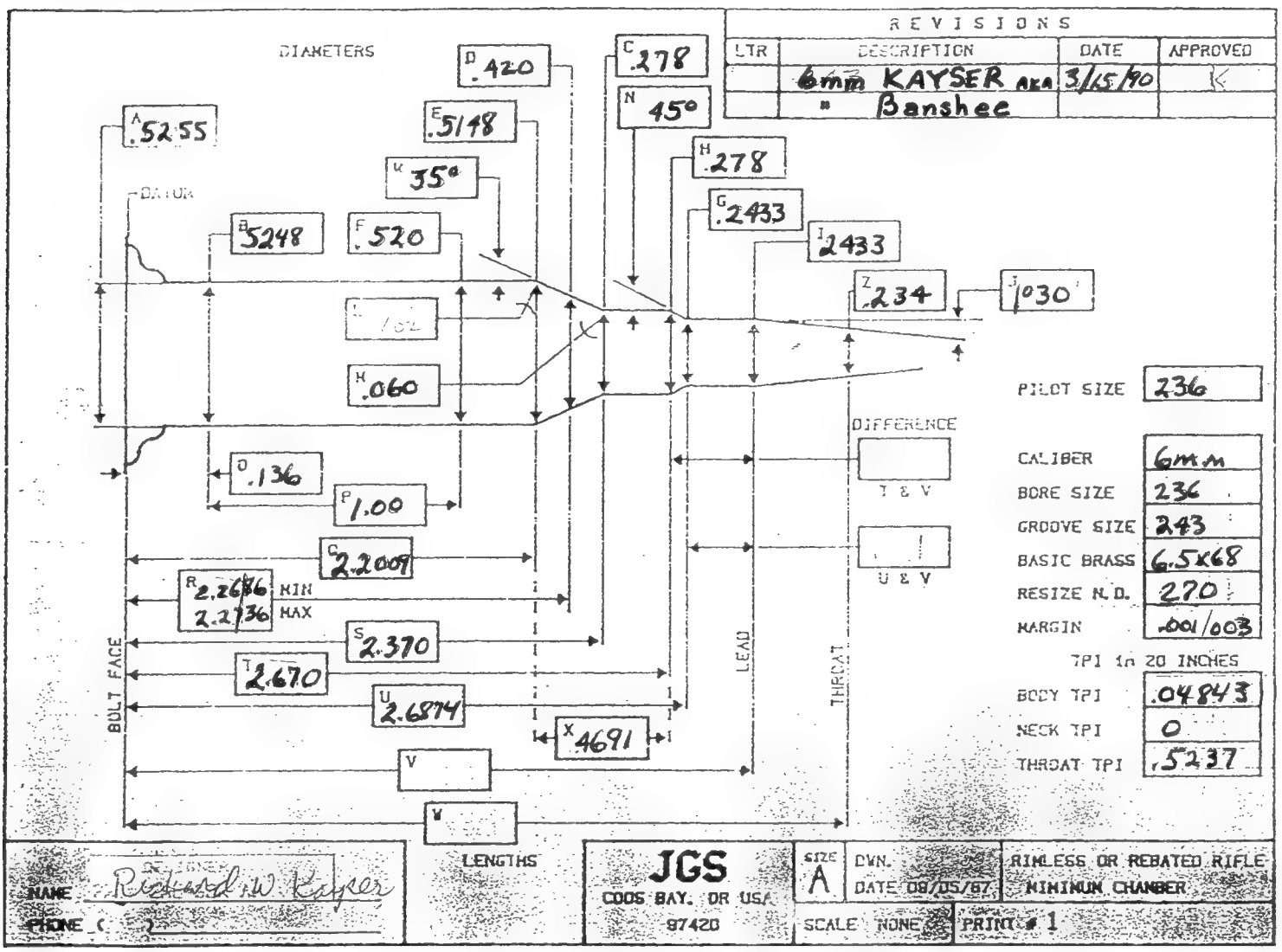

Ballistic Table English
CName:6MMBANSHEE 105GR VLD 0 Rge:500 Yards BC:0.625 File 6BANSHEE
Bul_Wgt: 105.0 Grs. MPBR: 0.00 Inches Above LOS, 0.00 Inches Below LOS
Base_Alt 4000 Feet Base_Temp 85.0 F. Alt_Alt 0 Feet Alt_Temp 59.0 F.
F/R Imp. 3.2 Lb/Sec F/R En. 11.2 Ft/Lbs F/R Vel 6.9 F/Sec

Flite Time	Range Yards	Rem Vel	Rem Eng	MoMntm Lb/Sec	Elev MOA	Total Drop	Bullet Path	Group Size	Angle +/- 0	Wind Def 10 Mph
0.00	0	3700	3191	1.72	7.3	0.00	-1.50	0.00	-1.50	0.00
0.04	50	3625	3063	1.69	-3.8	0.32	1.98	0.52	1.98	0.08
0.08	100	3551	2940	1.66	-4.6	1.30	4.81	1.05	4.81	0.30
0.13	150	3479	2821	1.62	-4.4	2.97	6.94	1.57	6.94	0.66
0.17	200	3407	2707	1.59	-4.0	5.35	8.37	2.09	8.37	1.17
0.21	250	3337	2597	1.56	-3.5	8.49	9.04	2.62	9.04	1.86
0.26	300	3269	2491	1.52	-2.8	12.41	8.92	3.14	8.92	2.74
0.31	350	3201	2389	1.49	-2.2	17.15	7.98	3.67	7.98	3.79
0.35	400	3134	2290	1.46	-1.5	22.74	6.20	4.19	6.20	5.00
0.40	450	3069	2195	1.43	-0.8	29.20	3.54	4.71	3.54	6.37
0.45	500	3004	2104	1.40	0.0	36.55	0.00	5.24	0.00	7.90
0.50	550	2941	2016	1.37	0.8	44.88	-4.52	5.76	-4.52	9.63
0.55	600	2878	1931	1.34	1.6	54.20	-10.04	6.28	-10.04	11.55
0.60	650	2816	1849	1.31	2.4	64.61	-16.64	6.81	-16.64	13.70
0.66	700	2755	1770	1.28	3.3	76.13	-24.36	7.33	-24.36	16.07
0.71	750	2695	1693	1.26	4.2	88.81	-33.23	7.85	-33.23	18.66
0.77	800	2636	1620	1.23	5.2	102.67	-43.28	8.38	-43.28	21.45
0.83	850	2577	1549	1.20	6.1	117.73	-54.55	8.90	-54.55	24.44
0.89	900	2520	1480	1.17	7.1	134.04	-67.04	9.42	-67.04	27.61
0.95	950	2463	1414	1.15	8.1	151.76	-80.96	9.95	-80.96	31.06
1.01	1000	2406	1350	1.12	9.2	170.81	-96.20	10.47	-96.20	34.70

0 Range at BASE Alt/Temp

Ballistic Table English
CName:6MMBANSHEE 105GR VLD 0 Rge:500 Yards BC:0.625 File 6BANSHEE
Bul_Wgt: 105.0 Grs. MPBR: 0.00 Inches Above LOS, 0.00 Inches Below LOS
Base_Alt 4000 Feet Base_Temp 85.0 F. Alt_Alt 0 Feet Alt_Temp 59.0 F.
F/R Imp. 3.2 Lb/Sec F/R En. 11.2 Ft/Lbs F/R Vel 6.9 F/Sec

Flite Time	Range Yards	Rem Vel	Rem Eng	MoMntm Lb/Sec	Elev MOA	Total Drop	Bullet Path	Group Size	Angle +/- 0	Wind Def 10 Mph
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0.04	50	3625	3063	1.69	-3.8	0.32	1.98	0.52	1.98	0.08
0.08	100	3551	2940	1.66	-4.6	1.30	4.81	1.05	4.81	0.30
0.13	150	3479	2821	1.62	-4.4	2.97	6.94	1.57	6.94	0.66
0.17	200	3407	2707	1.59	-4.0	5.35	8.37	2.09	8.37	1.17
0.21	250	3337	2597	1.56	-3.5	8.49	9.04	2.62	9.04	1.86
0.26	300	3269	2491	1.52	-2.8	12.41	8.92	3.14	8.92	2.74
0.31	350	3201	2389	1.49	-2.2	17.15	7.98	3.67	7.98	3.79
0.35	400	3134	2290	1.46	-1.5	22.74	6.20	4.19	6.20	5.00
0.40	450	3069	2195	1.43	-0.8	29.20	3.54	4.71	3.54	6.37
0.45	500	3004	2104	1.40	0.0	36.55	0.00	5.24	0.00	7.90
0.50	550	2941	2016	1.37	0.8	44.88	-4.52	5.76	-4.52	9.63
0.55	600	2878	1931	1.34	1.6	54.20	-10.04	6.28	-10.04	11.55
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0.77	800	2636	1620	1.23	5.2	102.67	-43.28	8.38	-43.28	21.45
0.83	850	2577	1549	1.20	6.1	117.73	-54.55	8.90	-54.55	24.44
0.89	900	2520	1480	1.17	7.1	134.04	-67.04	9.42	-67.04	27.61
0.95	950	2463	1414	1.15	8.1	151.76	-80.96	9.95	-80.96	31.06
1.01	1000	2406	1350	1.12	9.2	170.81	-96.20	10.47	-96.20	34.70

0 Range at BASE Alt/Temp

JOHN PALMISANO MEMORIAL RANGE UPDATE

by

Geza Nagy

The Wapwallopen, Pa. range previously known as the Council Cup range had been for sale for a while, and toward the end of 1988 it was purchased by Dr. Louis Palmisano, the co-originator of the widely known PPC cartridge (together with Ferris Pindell). The range's new name was dedicated to the memory of his late father, who passed away about two years ago. I first met his father at the 1987 Super Shoot. He was a very fine gentleman, and easy to admire. He was very active and spry for his 80 plus years of age. There is now a concrete memorial at the base of the range's flag pole, showing that the range is now dedicated to his memory.

The range is undergoing massive reconstruction; the improvements being made will eventually lead to a much larger range facility that will cater to many new forms of shooting besides its previous benchrest orientation. There will be accommodations for trap and skeet, sporting clay, quail walkshooting, high power position shooting (including 300 meters), rimfire and silhouette shooting. There is a spearate range, back a ways into the woods, for muzzle loader black powder shooting.

I first stopped in to see the range after the 1989 Super Shoot, on my way back home. Bulldozing and construction work had already been started.

I recently went back again, in April of 1990, and saw the many changes that have been accomplished to date. The ground has been leveled directly behind the firing line, and a fully covered loading area (130′ x 30′) was already up. This has two covered stairways, each 12′ wide, leading up to the firing line; one at each end of the loading area. The stairs have metal supports under each step to make them more sturdy. You can now go from this loading area up to the firing line in rainy weather without you or your equipment getting wet.

The front side of Palmisano's house now completed and furnished. Full length front porch. Nearest one was formerly the kitchen.

The back side of Dr. Palmisano's home. Now completed and furnished.

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by

Brian Rubright

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Filled in area to accommodate 20 new benches and firing positions for 300 meter high power shooting. All of the range is now scheduled for 300 yard and 300 meter shooting.

Memorial monument by flag pole. Covered loading area and two covered stairs leading up to range. One at each end.

Covered loading area and two covered stairways leading up to range. One at each end.

Across the road from the loading area is the trailer-type house that the caretaker had been living in. This will be converted to bathrooms and showers facilities. Also across the road another 20′ x 60′ trailer-type building has already been built. This one has two bedrooms, and is fully furnished, including bath and showers. It can be used for scoring and stat work. There have been two more of these buildings installed up the road, past the pond, and a new parking lot for 35 cars is adjacent. These are all heated, and air-conditioned.

The parking place behind the range is still there, across the road. Another one, below that, is being cleared and leveled, for more parking.

From the outside, the old kitchen looks exactly like it used to. From the front, another new building was put up, that looks exactly like the old kitchen building. There is a court yard in between them. The backside has a long, wide connecting hallway between the two buildings, making the whole thing u-shaped. This is Dr. Palmisano's new home. It has been completely finished inside, and is now a beautiful home, fully furnished.

As this is written, in early May, I decided to pick up the phone to verify some of the context of the article. Things are going ahead rapidly since I was there a few short weeks ago. The main road up the hill to the range has been graded to remove the bumpy conditions. Six new culverts have been installed, for drainage of the rainwater runoff.

The area between the road and the pond, in front of Dr. Palmisano's house, will be filled in for parking. 200 amp electrical outlets for trailers are being installed in back of the house, and also to the area behind the range.

Continued on next page

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MEMORIAL

Continued

The area between the firing line and the spring house has already been filled in and leveled, where eventually 20 new benches will be added. All of the dirt from the right side will be used as fill for the gullies on the left side. The earthmoving contract calls for moving 50,000 tons of earth. When completed, the range will be level, side by side, tapering uphill all the way to 300 yards and 300 meters. All of the trees in the old loading area above the wailing wall have been cut down to ground level, up to the edge of the woods.

The time schedule to complete all this will depend on the weather, and the availability of construction equipment when the weather is good. Scheduled for completion this year will be 40 benches, with 100-200-300 yard target lines. High power 300 meter position shooting will also be available, with paved positions in front of the existing benches. The target frames will be more centralized, to minimize shooting at an angle at the far end of the range. A new backer system (circular type) will be scheduled for next year. Some propane gas grills will be put up for shooter's use in the area between the loading area and the flag pole. A fire barrier will be put up between the two areas.

The Coors match is scheduled for May 19-20, 1990. The Cast Bullet Nationals is scheduled for September 8-9, 1990 at this range.

Good luck to Dr. Palmisano in the huge effort that he is expending to make this range into one of the premier ranges of the United States. Many of us can look forward to the day when benchrest shooters will again gather at this facility, and we await the rangemaster's directive of "commence fire" at this beautiful range.

(Photos courtesy of the author).

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Old caretaker's house and new one built.

Old club house used as stat house. Now has porch added to side. Can be used as loading area. Not covered.

Woods have been cleared back (center of photo) on right side of range for 300 meter shooting. All of the range is now scheduled to have 300 yards and 300 meters.

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Dear Dave,

I enjoyed the "For Sale" spoof by Bud Salyer (page #28 and 29, March issue). I'm writing from Alaska, as you can see; a place where rather large brown bears have been known, from time to time to become a trifle angry with hunters . . . for a multitude of reasons.

I am attaching herewith a copy of an ad that was in today's Anchorage Times newspaper. One has to wonder how a large Brownie is going to react after he has been shot in the posterior with a .375 H&H . . . loaded with a 30 grain bullet? (Editor: Can anyone do a Sierra trajectory table for us on this . . . I would like to see the bullet drop from 100 to 1000 yards for a 30 grain, .375 H&H round. If it looks good . . . we'll build one).

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EPOXY

Dear Dave,

You printed a letter, with an accompanying two page ratio list for mixing epoxy by Ron Nosack in the February issue of PS.

I myself have never used either Devron or Bisonite; instead I have come to prefer two other products for bedding that I think are hard to beat.

The first is Philly-Bond Blue, with a one to one ratio for mixing, and the other is Marine-Tex, with a five to one mix ratio.

Because, as Ron mentioned, the epoxy is thick and gummy, a screwdriver is really needed to dig it out and mix with it.

I take straight wall copper tubing . . . for the Marine-Tex a 2½″ length of ¾″ diameter for the epoxy, and a ½″ length of ¾″ for hardener. Pack these tubes full, with the screwdriver, and later you will push the contents out with a ¾″ wood dowel into the mix container.

The empty tubes and dowel are dropped into a can of lacquer thinner for cleanup at your convenience.

For smaller batches, use smaller tubes; ½″ or ⅜″, with corresponding smaller dowels for pushing.

Just keep the tubes the correct length for your particular epoxy's mix ratio, and it is hard to go wrong.

John Patton
1385 Topaz Ranch Dr.
Wellington, Nevada 89444

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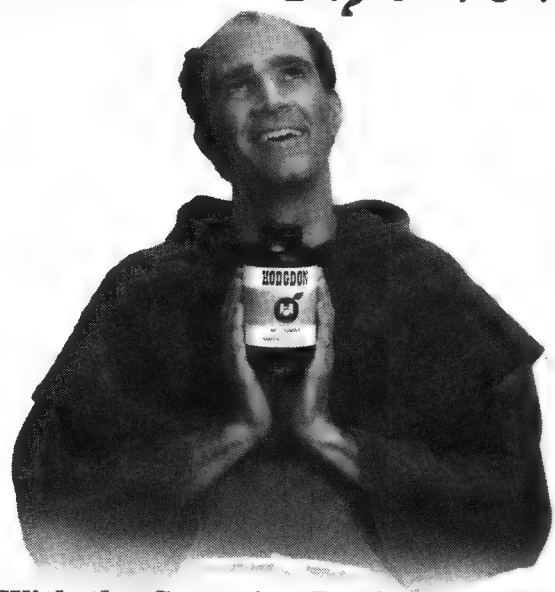

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MOVING BACKER SYSTEMS

by

Geza Nagy

In recent articles in PS it was the sentiment of several writers that what the world badly needed was not so much a good five cent cigar as rather a moving backer system to verify the number of shots fired in an efficient and accurate fashion . . . and without having to call into service a Cray mainframe computer. Let me briefly explain how present-day systems work, and their major flaws.

There are basically two systems in operation today. One of them draws paper from a roll at one end, through a set of brackets and slots attached to the main target frame, to the threaded rod turned by a motor with a gear reduction device at the other end. This paper is wide enough to cover the complete area of the record target only. It does not cover the sighter target at the bottom of the frame. The timing of the speed of travel of this paper is controlled by the speed of the motor, the amount of reduction in the gear reducer, and the size of the threads in the threaded rod. The end results in the systems that I was involved in building was a travel of an inch and a quarter of the paper every minute. This speed is sufficient for ordinary purposes, but is not infallible, as I will show you later. (Editor: Most of us believe you right now, even without "later showing").

The other main system in use employs pieces of cardboard of the backers. This system requires a complete new set of frames behind the main target frame, with cardboards inserted in this frame, behind each individual's target. This new set of frames will be pulled along behind the main target frame with a set of pulleys, and a track on the main target frame for the pulleys to ride on. The end result was the same as with the paper roll . . . an inch and a quarter of travel per minute . . . with the same motor, gear reduction drive, and threaded rod.

The width of the cardboard or paper has to be at least eight inches wide (vertically) to cover the record target area (only) at 100 and 200 yards. At 300 yards a new set of frames had to be built, due to the increased size of the targets. the 300 yard record target measures 14 inches vertically, and 12 inches horizontally. What was adequate for 100 and 200 yard targets is no longer adequate at 300 yards.

The target spacing side to side should be relative to the bench spacing side to side. If your benches are four feet apart (center to center), then an eight foot section of target frame could be used to achieve to complement the equal four foot spacing at the benches. If the benches are ten feet apart (center to center) you would be well advised to use ten foot sections of target frames to get equal five foot spacing of targets on the frames. There are several ranges that I am acquainted with where this law of relationships wasn't taken into consideration when the club was Creating the World. And, as a result, at the extreme end of the firing line they are no longer shooting at the same distances as at the other end of the range. One can find himself shooting at 110 and 120 yard distances on these far-end targets, while bench number one is shooting at a proper 100 yard distance. On such ranges the practice of bench rotation does help to keep things equitable.

I previously mentioned that any system now in use is not infallible. The wind and pouring rain can tear the paper system to shreads. A few years ago I witnessed this at a National Championship, in the heavy bench class. We never had this problem in Englishtown while using a similar system . . . although in all fairness I have to doubt that we ever got such a dose of wind and rain both as descended on the Nationals that day.

The same thing can happen with the cardboard system, if an inexperienced target crew does not staple the backers and/or the targets on properly. Extreme winds can be a problem here, even without the addition of rain at the same time.

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Neither cardboard nor rolls of paper are available cut to the proper sizes needed to suit range systems. Hence, each individual range has to do their own cutting to suit the dimensions of their system. This results in a lot of work for the club, whose people have enough work (and more) to go around, when a registered match is getting close. At Mainville one year, when they were hosting the Nationals, I could not believe the mountains of cardboard that were stacked on tables the full length of their large clubhouse . . . backers for the match.

The length of travel for the backers will be determined by the time limit of the class being contested. At an inch and a quarter per minute, the heavy bench warmup match (15 minutes) will require 18¾ inches; the heavy benchrest record target requires 15 inches. In the varmint classes the warmup match (10 minutes) requires 12½ inches, and a record match will use up 8¾ inches for the 7 minutes. On those systems that use a paper roll it is easy to see how may matches you can bet before it is time to change. If one errs here, the shots from the next bench begin to overlaps with the shots from the next bench on the backer roll.

As these dimensions get bigger, so also do the chances of the wind blowing your backers out of their frames.

Now, let us consider a "what if . . ." for those who might feel that a properly operating moving backer system is "infallible". (Editor: The ranks of the believers in infallibility of backer systems has grown mighty thin in recent years . . . but go ahead anyway). Most of the backer systems in current use travel horizontally . . . either left to right, or right to left. Let us say that in this case the backer system is moving left to right. You put a shot on paper (not necessarily your first shot). The good condition continues to hold, and you quickly fire your second shot. This one cuts the bullet hole of your previous shot, a half bullet to the right . . . exactly horizontal . . . relative to the other hole. In the meantime the backer moved that corresponding amount in the same direction . . . and that shot went into the exact same hole in the backer. This CAN happen . . . even though the shot was one inch or more from the first hole . . . as long as that shot is on the same plane as the direction of travel of the moving backer . . . and the backer moved the same corresponding amount.

I have been a referee at many matches. At 200 yards, where the bullet dispersion gets greater, I have seen targets where five distinct bullet holes could clearly be counted on the target itself . . . and yet only four holes could be counted in the backer. Fortunately the rules call for the shots counted on the target to over-rule the shots counted on the backer. At times one is able to see an egg-shaped hole in the backer, which would account for the missing shot. Sometimes we have had to measure each hole in the backer under a magnifying glass, in an effort to find if one of the four visible bulletholes is perhaps a few thousandths of an inch larger than the other holes.

Those shooters who shoot rapidly (we call it machine-gunning) increase the possibilities of being disqualified. Under normal conditions if the backer is moving at its normal pace the shots will show on the backer, even if you do shoot rapidly. Except for the possibility previously described there would still be an egg-shaped hole in the backer. Ten shot groups make things more difficult yet. Any two shots in a group that are on the same plane increase the possibility of shots going through the same hole in the backer.

I recall one occasion when I was a referee at the Mainville, PA. range. We had to disqualify a shooter for only having four shots on the record target at 200 yards. The group on the target and on the backer was

Continued on page 53

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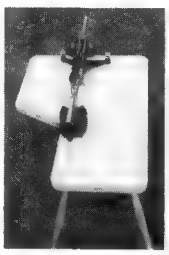

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Groups of figures, abbreviations and initials count as words. Hyphenated word counts as two words. Name and address of advertiser is counted. Use full words instead of initials and abbreviations and make your meaning entirely clear.

Classified type ads: no display. **Rates:** 15 cents per word per insertion, prepaid. Minimum charge is $1.50. Closing date for ads is the 1st of the month preceding publication. To illustrate: we must have your ad copy in hand by August 1st to make the September issue.

FOR SALE: McMillan graphite benchrest stock, HV/LV, w/weight cavity and removable buttplate. Inletted for Stolle Panda, finished and painted pewter by Sinclair, $175.00. Leupold 36X targetscope, crosshair reticule, $250.00. Leupold 24X scope, crosshairs, $25. Original BLC-1 powder, 16 pounds @ $12.50 per pound. All prices plus UPS charges. Lee Andrews (406) 442-5560 days; 442-9813 evenings.

HART deluxe arbor press, $75. Masker/RCBS measure, $70. (503) 668-9011.

FOR SALE: Combination HV and HB. Shilen DGA action, CPS aluminum skeleton stock, 6PPC Hart, 22PPC Lilja. With HB additional front rails and rear weights. $1,100. (206) 588-7362.

FOR SALE: Seven piece RCBS .17 caliber Javelina form and loading set. The set consists of #1 form die, #2 form and trim, #3 form and trim, final trim, neck reamer die with reamer. Also have Forster .17 caliber case trimmer cutter shaft with .17 pilot and .17 inside neck reamer, crankshaft handle and adjusting collar. $120.00 postpaid for the lot. Inspection. (217) 774-3142 evenings.

FOR SALE: XP-100 pistol, brand new in box, .223 or .35 Remington, $314 postpaid lower 48, Mike (205) 878-1636.

WANTED: Unertl or Lyman target scope, Mike Swetina, Rt. 5, Box 348-B, Albertville, Al. 35950 (205) 878-1636.

FOR SALE: Precision Shooting collection, 1956 to present, taking sealed bids on. Xerox copies at $5.00 per issue, or specific articles (?). Sunshine E. Company, Route 5, Box 348-B, Albertville, Al 35950. (205) 878-1636.

Eliminate "grabby" bags. Use clear polyolefin rifle tape. Enough for two rifles, $6.95. Ron Hoehn, 1430 E. Duchesne, Florissant, Mo. 63031. (314) 837-3846.

WANTED: Unertl scopes, varmint models preferred, but targets O.K. if in excellent or better condition. Also high wall actions or complete guns suitable for tearing down only. Dick Wright, 9421 E. Mannsiding Rd., Clare, MI 48617. Ph. 1-517-386-3932.

FOR SALE: Sporter 6mmBR, Wichita RH bolt, LH port, Hart barrel, 750 rounds, Hart trigger, B&L rings, unfinished McMillan stock, $850 firm. Roger (304) 863-6830 evenings.

FOR SALE: Leupold Vari-XIII 6.5x20 target scope with duplex. Like new in box, with target knobs. $200. (316) 442-8436.

FOR SALE: American Rifleman magazine (1964-present) $50. 13 years Guns and Ammo magazine (1958-1971) $50. Must pick up in Washington, D.C. Ross Perry (202) 333-2783.

FOR SALE: B&L Legacy 7 15x35mm Zoom binoculars new, still in box w/leather carrying case $100.00 plus shipping. Also Wilson neck dies and bullet seater for 30-06. And 22-250 with 40 degree shoulder, $40 per set, plus shipping. Call Bill after 6:00 PM (304) 854-2304.

.17 SHOOTERS: New coated rods by the J. Dewey Co. 26″, $19.50 and 36″, $21.50, complete with jag. Brass core bronze brushes, special, $1 each, $10 dozen. 100% cotton flannel patches 3/4″ square, $3.75/500 or $7.35/1000. Send ample shipping plus $2 per rod, excess refunded. SASE for full price list of precision shooting items. Russ Haydon's Shooters' Supply, 815 S. 70th, Tacoma, WA 98408. (206) 472-5507, 5-9 p.m. Pacific time; 5th ring is machine.

FOR SALE: Sporter, 6PPC, .262 neck, 40X action, McMillan stock, Shilen trigger, two Schneider barrels fired 100 and 11 rounds respectively, Leupold 36X, 50 rounds 220 Russian brass, Wilson dies. Smithed by Sinclair. $1200. Boyd, (307) 382-3670.

REM. 40XBR Heavy Varmint, .222 Rem. 2 oz. trigger, 36X Leupold. Like new, fired less than 200 rounds. Box, factory target. $1150. John Olsen, (804) 272-8067 after 6 pm, EDT.

FOR SALE: HV 6PPC, 262 neck, new, never fired. Wichita action, Hart rings, Shilen 2 oz. trigger, Hart barrel, McMillan graphite stock, painted, your choice of colors, with seating and neck gauge and rod guide, $1,595. FFL required. Dies available. For switch barrel HV-HB (cruiser), including change weights and 1.250″ heavy bench Hart barrel, add $415. These guns not in on-hand inventory, built to order, 90 days delivery. Seely Masker (716) 689-8894.

FOR SALE: 220 Swift, Stainless Varmint Barrel, Remington Action, 24x Leupold Scope, Fiberglass Stock. Like New. Hard Case and Reloading Accessories. $1,100. (502) 781-5356, Evenings or (502) 781-6000 Days, David Huffman.

FOR SALE: High power silhouette "hunting rifle". Remington long 700 action. .308 Winchester with .328 neck. Shilen barrel - shaped to contour of factory barrel. Remington laminated stock - refinished - very nice. Tuned, barreled and bedded by Hammonds. Six boxes of WCC 58 cases included. Less than 150 rounds. $700. Unfired Winchester Cartridge Company (WCC) 1958 .308 Winchester cases. "Probably the best .308 cases that have ever been made". $1.00/each. Anshutz 54.18 MS-ED .22LR silhouette rifle with Fajen thumbhole silhouette stock - silver maple - fiddleback figure - extra fancy. Excellent condition. $850. Hal 303-772-3730 after 5 PM MST.

FOR SALE: Sporter, 6PPC, .262 neck, new, never fired, Panda action, Kelbly rings, Shilen 2 oz. trigger, Hart barrel, McMillan stock, painted (your choice of color), with seat and neck gauge and rod guide. Dies available. $1,780. These guns not in on-hand inventory, built to order, 90 days delivery. Seely Masker (716) 689-8894.

FOR SALE: BOOKS: Marine Sniper by Chas. Henderson, $4. Single Shot Rifle Notes, Yesterday and Today, by Gerald Iver, $12. The Accurate Rifle, by Warren Page, $7. The Practical Paper Patched Bullet, by Paul Matthews, $9. Complete Guide to Handloading, by Phil Sharpe, $55. The Springfield 1903 Rifle, by Brophy, $45. U.S. Rifle M14 From John Garand to The M21, by Blake Stevens, $45. Shots Fired in Anger, by Lt. Col. John George, $14. The Book of The Springfield, by Captain Edward Crossman, $39. Small Arms Design and Ballistics, Vol. I, by Col. Whelen, $38. Yours Truly, Harvey Donaldson, $17. Hatcher's Book of the Garand, $25. Hatcher's Notebook, $25. Military Rifles of Japan, 2nd Edition, by Fred Honeycutt, (Xerox copy) $15. GUNS AND EQUIPMENT: M96 Swedish Mauser 6.5x55, 22″ barrel, Lyman sights, mint, $110. FN Venezuelan contract, Model 24/30 (M98), barreled action, 7x57, mint and really shoots, $175. M98 action, less bolt, BRNO 1937, v.g., $40. Matco s.s. match barrel, 284 Winchester, fits M98, as new, $50. Saeco-Masker micrometer powder measure, $199. JGS reamer, new, 7mm x 6.5 Rem. mag, .313 neck, .511 rear end (tight neck turkey) $50. Mike Swetina, Rt. #5, Box 348-B, Albertville, Al. 35950. (205) 878-1636.

MOVING BACKER SYSTEMS

Continued

diagonal. No two shot on either were on the same plane of travel of the moving backer. We had no choice but to disqualify the gentleman. You have tho have two shots on the target . . . slightly separated . . . in the plane of travel of the backer . . . to account for the possibility of two shots going into the same hole in the backer. Any shots above or below this line will show up as individual shots on the backer.

It does not matter the moving backer is moving . . . it could be horizontal, vertical, or even in a circular pattern. The same possibility exists no matter what the direction of travel. I grant that this happens most infrequently, but the fact remains that it CAN happen . . . and on occasion DOES happen . . . that the next shot fired by the competitor goes through the same hole in the moving backer . . . due to a combination of circumstances that are UNUSUAL . . . but not at all IMPOSSIBLE.

So what can we do about correcting the situation? I have been thinking about that riddle for 18 years now, trying to come up with a fool-proof system. Increase the speed of the backer? Probably would HELP . . . but from a theoretical viewpoint the same "something" could still happen; and you would have to enlarge the size of the backer system, and create new problems.

I know that some will say "electronically". I have been at Fort Benning twice, when the Olympic and U.S. shooting teams shot 300 meter high power matches. The range used a system that counted shots by sound, but was only activated when the shooter was ready to fire "for record". The shooters we assigned partioned shooting spots; one could, and indeed had to, fire all his sighter shots before "going to the record target" . . . at which point the system was actuated. There was no going back to the sighter target, as we often do in benchrest shooing. Once the shooter had begun his record target all shots had to appear thereon, or else a zero was scored for the fired shot that did not appear on the record target.

The system was complex, and I'm sure, expensive. The record targets were scored electronically, with the TV monitors at each position. These monitors would show the target face, and the location of each shot on the target. A print out tape would show the shot number, the score, and in what direction from the center that shot went. Besides that, there was a separate TV monitor above and behind each shooter for spectators to watch. In addition there was another set of the monitors of each shooter in the scoring shack.

Obviously such a system would not be necessary in hunter class matches, or score matches, where we only have one shot on each bullseye. There has been some articles in P.S. lately concerning electronic scoring of group targets. I gather that it is possible, and probably even the ultimate state of the art. But the clubs that put on registered matches have enough of a struggle as it is, with both labor and costs . . . and I simply do not see it in the tea-leaves for them to have to deal with a complex and expensive system that requires an electronic wizard to install, maintain, and operate.

Staying with purely mechanical systems, there IS a way to deal with the present problem. The backer system has to move in two different directions at once. The obvious way to do this is to have TWO moving backers . . . one moving one way . . . the second backer moving in the opposite way, or perhaps vertically. This would, without question, do away with the "through the same hole" problem. However I am sure that such a system would complicate further a range installation. It is hard enough to put on a registered group match as it is now!

Thus, we have to decide . . . do we live with the very occasional possibility of "two shots through the same hole" . . . as a practical matter . . . or go to remove that possibility? I leave that answer to others who are wiser than I.

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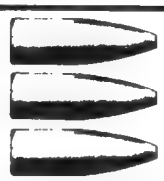

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IBS News

Edited by Dave Brennan

YORK

DON GENTNER paced a field of some 52 shooters in the 100 yards heavy varmint class at the York, Pa. range on April 8th. The top 20 shooters for the class were:

1. Don Gentner 0.2592
2. Michael Norton 0.2704
3. Bob White 0.3034
4. John Kunzler 0.3062
5. Randy Watson 0.3122
6. Bert Rypkema 0.3136
7. Eric Fykes 0.3138
8. Harlan Hoffer 0.3184
9. Barry DeVliegher 0.3352
10. Henry Vranian 0.3428
11. Henry Buhrman 0.3450
12. Don Jones 0.3468
13. Brian Rubright 0.3556
14. Jim Borden 0.3604
15. Mike Barlow 0.3680
16. Matthew Green 0.3738
17. Edna White 0.3888
18. Willie Bauer 0.3914
19. Dick Grosbier 0.3926
20. Pete Frask 0.3934

100 Yard Sporter Aggregate

1. Fred Reisinger 0.5306
2. K.L. Miller 0.5060
3. Wm. C. Wagman 0.5286
4. Vince Pastorella 0.6386
5. Robert Linn 0.6732
6. Carl Baker 0.6846

IWLA H VH &V FOR GROUP, IWLA Chapter #67, York,Pennsylvania 04/08/90

Heavy Varmint Grand Aggregate Top 10 Equiment List

name	caliber	action	barrel	gunsmith	stocker	scope	power	case	load	bullet	prim
D. Gentner *	6 PPC	Stolle	Shillen	Hammonds	Genter	Leup.	36X	Sako	28.5g T322	Genter 65g	205
M. Norton *	6 Taldog	40X	Hart	Hasecuster	Sinclair	Leup.	30X	Rem.	29.0g T322	Norton 65g 9	Fed.
B. White *	6 PPC	CPS	Schneider	B. White	B. White	B&L	36X	Sako	28.4g H322	Rubright 63g	Fed.
J. Kunzler	6 PPC	Hart	Hart	Masker	Hart	Leup.	X	Sako		Euber 68g	Fed.
R. Watson *	6 PPC	Hall	Shillen	Hammonds	Hammonds	Leup.	36X			Bravand	
B. Rypkema *	6 PPC	Stolle	Lilja	Hammonds	Hammonds	B&L	36X	Sako	27.5g G.I.322	Watson 68g FB	205
E. Fykes *	6 PPC	Witchita	Hart	Dowling		Leup.	36X	Sako	27.5g T322	Watson 68g FB	Fed.
H. Hoffer	6 PPC	Hall	Hart	Masker	Masker	Leup.	36X	Sako	27.7g H322	Euber 68g	Fed.
B. DeVliegher	^ PPC	Stolle	Hart	Masker	Six	Premier	45X	Sako	28.4g H 322	Euber 68g	205
H. Vranian *	6 Talldog	Hall	Hart	Hasecuster	Dowling	Leup.	36X	Rem.	28.0g H322	Norton	Rem

I.B.S. Varminthunter & Hunter For Group

name	caliber	action	barrel	gunsmith	stocker	scope	power	case	load	bullet	pri
F. Reisinger	308	600	Hart	Green	Green	Weaver	6X	Fed.	40.0g H4895	Sierra168g	Fed
K. Miller	6 PPC	Rem.	Wiseman	Hammonds	Self	Weaver	6X	Sako	28.0g T322	Watson 68g FB	205
W. Wagman *	6 PPC	Rem.	Lilja	Hammonds	Hammonds	Weaver	6X	Sako	27.0g H322	Fowler 68g	205
V. Pastorella	308	Rem.	Hart	Self	Self	Weaver	6X	Win.	41.0g 4895	Own168g	Fed
R. Linn	6 PPC	Rem.	Hart	Hammonds	Hammonds	Lyman	6X	Sako	27.6g T32	Watson 60g FB	205
C. Baker	30 HC	Rem.	Lilja	Lilja	Lilja	Weaver	6X	Fed.	37.5g H4895	GTB125g	Rem

INTERNATIONAL BENCHREST SHOOTERS
USA CLUBS

sortname	Street Address	City	State	Zip Code	Club Director	Country	Expiration Date
CAMILLUS SPORTSMEN'S CLUB	420 HAWLEY AVE	CAMILLUS	NY	13203	HANK GONNELLA	USA	FEB91
CAPITOL CITY R & P	17 FOREST AVE	AUGUSTA	ME	04330	JOE GILBERT	USA	JUN90
CENTRAL JERSEY R&P CLUB	1487 CEDARWOOD DR	LAKEWOODD PARK	NJ	08701	THOMAS STONER	USA	MAR91
DUNHAMS BAY FISH & GAME CLUB, INC.	112 FEEDER ST.	HUDSON FALLS	NY	12839	WALT HODGES	USA	APR90
FACTORYVILLE SPORTSMEN CLUB	RD1 1005 PHEASANT RD	CLARKS SUMMIT	PA	18411	PAUL RYAN	USA	AUG90
FAIRCHANCE GUN CLUB	RD#2 BOX 21	SMITHFIELD	PA	15478	ROY LECKEMBY	USA	NOV90
FLORIDA B.R. ASSOCIATION	12701 SW 9TH PL	DAVIE	FL	33325	DTONY HIDALGO	USA	SEP90
GENESEE CONS. LEAGUE RIFLE CLUB	PO BOX 92327	ROCHESTER	NY	14692	JOHN WAGNER	USA	APR90
Guthsville Rod & Gun Club	P.O. Box 156	Orefield	Pa	18069	DAVID KERN	USA	APR91
GUTHSVILLE ROD GUN CLUB	PO BOX 156	OREFIELD	PA	18069		USA	APR91
I.#.L.A.-York	RD#4, Box 535	Red Lion	Pa	17356	CHARLES KINARD	USA	FEB91
KELBLY'S RIFLE RANGE	7222 DALTON FOX LAKE ROAD	NORTH LAWRENCE	OH	44666	GEORGE KELBLY	USA	DEC90
LEE TOWN GUN CLUB/IWLA	905 REDBUD DRIVE, FOREST HILLS ESTATES	MARINSBURG	WV	25401	BOB BROYLES		APR90
MAINVILLE SPORTSMEN CLUB	RD#3, BOX 572	BLOOMSBURG	PA	17815	RANDY FRITZ	USA	APR91
MARKSMAN GUN CLUB	P.O. BOX 655	PERRY	OH	44081		USA	MAR91
MILLPORT SHOOTERS	1707 PORT OBI RD	PORTVILLE	NY	14770	AL SKIVER	USA	APR90
ORIGINAL 100 YARD BENCHREST CLUB	P.O. BOX 1413	WILLIAMSPORT	PA	17701	SARAH MORGAN	USA	APR90
PAINTED POST FIELD AND STREAM	P.O. BOX 325	CORNING	NY	14830	CRAIG BARAVELLE	USA	MAR91
PINE TREE RIFLE CLUB INC.	P.O. BOX 45	JOHNSTOWN	NY	12095	CHARLES CLARK	USA	APR91
PRAIRIE DOG TARGET CLUB		PORCUPINE	SD	57772	DON DECKERT	USA	APR90
SALISBURY ROD & GUN	Rt 3 Box 109 B	Snowhill	MD	21863	Jack Lewis	USA	NOV90
SNOW SHOE GUN CLUB	P.O. BOX 125	KENAI	AK	99611		USA	OCT90
SOUTH CREEK NORTHERN TIER SPORTSMEN, INC	408 HOFFMAN ST	ELMIRA	NY	14905	DAVE TAYLOR	USA	APR91
SULPHYR SPRINGS RIFLE REVOLVER CLUB	304 S MARKET	MUNCY	PA	17756	JOHN PFLEEGER	USA	MAR91
THURMONT CONS & SPORTSMANSD CLUB	11113 PUTMAN RD	THURMONT	MD	21788	RICHARD PRYOR	USA	MAR91
TITUSVILE SPORTSMEN'S CLUB	BOX 110	TITUSVILLE	PA	16354	LARRY SHEATS	USA	JUN90
UNION COUNTY SPORTSMEN	RD#1	MILLMONT	PA	17845	RICHARD ALTEMUS	USA	DEC90

Count: 27

INTERNATIONAL BENCHREST SHOOTERS
INTERNATIONAL ASSOCIATIONS

sortname	Street Address	City	State	Zip Code	Club Director	Country	Expiration Date
A.F.T.B.R.	14 RUE DES SOLEIL	NICE		06100	JEAN CLAUDE BRACONI	FRANCE	JAN91
BENCHREST SHOOTERS OF CANADA	BOX 238	LEADER	SA	SON 1H0	WAYNE MILLER	CANADA	APR91
DBRV	BAHNHOFSTR.2	4284 HEIDEN			MARTIN MENKE	WEST GERMANY	AUG90
DOLOMITI, BENCHREST	DOBBIACO(B20)			39034		ITALY	JUN90
FINLAND BR SHOOTERS	ALEKSANTERINKI S35 BY	TAMPERE		33110		FINLAND	NOV90
U.T.I.B.R.	C/O T.S.N.	CODOGNO	FOMBIO	20070	REMO CACCIA	ITALY	JUN90

Count: 6

PRE-REGISTRATION REQUIRED

1900 IBS CHAMPIONSHIPS

Kelbly's Rifle Range, Marshallville, Ohio

August 20 through 25, 1990

CLASSES:

HEAVY BENCH (Five 10-Shot matches at each yardage)
LIGHT VARMINT, SPORTER, HEAVY VARMINT (Five 5-Shot matches at each yardage)
Warm-up Matches will be held on August 20, 21, 24, 25
Warm-up Matches will be held time permitting August 22, 23

COURSE OF FIRE:

August 20	100 Yard Heavy Bench
August 21	200 Yard Heavy Bench
August 22	200 Yard Sporter and Light Varmint
August 23	100 Yard Sporter and Light Varmint
August 24	100 Yard Heavy Varmint and Powder Puff
August 25	200 Yard Heavy Varmint

AWARDS:

IBS Travelers
- Shooters Choice Trophy, sponsored by Venco Industries — 4-Gun Champion
- Field & Stream Traveling Plaque — 3-Gun Champion
- Kelbly Enterprises Traveling Cup — 2-Gun Champion
- Precision Shooting Traveling Plaque — LV Champion
- Cpl Miller Memorial Traveling Plaque — Sp Champion
- Gun Digest Traveling Plaque — HV Champion
- A.H. Angerman Memorial Traveling Plaque — HB Champion
- Joseph P. Borden Memorial Traveling Cup — HV Champion Team

Keeper Plaques: Each Grand Aggregate Champion, Each Multiple Gun Champion, Junior Heavy Varmint Champion, Heavy Varmint Team Champions (Provided by PS)

Top 20 patches: Heavy Bench Grand, Light Varmint Grand, Sporter Grand, Heavy Varmint Grand, LV/SP Two Gun, LV/SP/HV Three Gun, LV/SP/HV/HB Four Gun

Champion Patches: Yardage Champion in each class, Grand Aggregate Champion in each class, Each Multiple Gun Champion

Match Pins: Match winner for each record match in each class (New design enameled pins)

Trophies (Club): First through Fifth each Range Aggregate; Second through Sixth each Grand Aggregate; Second through Sixth each Multiple Gun; Small Group each yardage, each class; First Place Jr HV 100 Yard, First Place Jr HV 200 Yard, Second Place Jr HV Grand Aggregate

★★

August 24 — Merchandise Drawing and Chicken Dinner

★★

PRE-REGISTRATION:

$15.00 first gun and $7.00 each additional gun plus $1.00 IBS fee each day
Juniors (17 and under) are half price

Deadline for pre-registration is July 20, 1990. A late fee of $10.00 will be assessed after that date.

ACCOMMODATIONS:

Knights Inn, Wadsworth (216) 336-6671
Knights Inn, Canton (216) 492-5030

ADULT FEE SCHEDULE

HB (2 Days)	$32.00
LV/SP (2 days)	46.00
HV (2 Days)	32.00
LV/SP/HV	78.00
LV/SP/HV/HB	110.00

OFFICIAL PRE-REGISTRATION FORM
IBS 1990 NATIONALS

Send entries to:

KELBLY'S RIFLE RANGE
7222 Dalton Fox Lake
North Lawrence, OH 44666

Phone: 216-683-4674

Make check payable to:

KELBLY'S RIFLE RANGE

You are required to be an NBRSA or IBS member to participate, OR BRSC.

Pre-registration is required at least thirty days before date of matches. The IBS Board of Directors has authorized a $10 penalty for late registration. **Total refund if not present.**

KELBLY'S RIFLE RANGE
MARSHALLVILLE, OHIO
August 20 through 25, 1990

Check the boxes for the class or classes you wish to shoot.

UNLIMITED ☐ SPORTER ☐ LIGHT VARMINT ☐
HEAVY VARMINT ☐

Are You Left Handed ☐ YES ☐ NO

Please Note: To facilitate statistical operations, 4-gun shooters will be squadded on the first relays.

SIGNATURE_____ DATE_____

NAME (Please print or type) _____

STREET _____

CITY_____ STATE_____ ZIP_____

YORK

CALVIN WILLARD had a nice 250-19x score in the varmint for score class at York, Pa. on April 22nd, to take a clear-cut win over 17 other shooters. Of interest from an equipment viewpoint, was the fact that the winner shot a ".30 Short", with S.G. 150 grain bullets, plus a 60X boosted power scope! Top ten shooters for the class were: 1.) Calvin Willard 250-19x, 2.) Douglas Rea 250-14x, 3.) Bert Rypkema 250-14x, 4.) Bill Gebhardt 250-13x, 5.) Eubert Burgess 250-8x, 6.) Richard Hain 250-7x, 7.) Richard Pryor 249-16x, 8.) Mike Barlow 249-14x, 9.) Bill Theis 249-14x, 10.) Frank McKee 249-14x.

RAY SILVER won the hunter-varmint class (4 shooters) with a 250-12x score, beating out Gary McPherson's 248-9x.

GUY GREEN took the hunter class (7 shooters), via a 248-13x score. Erwin Shinkle was second, and Vince Pastorella was third, with 246-7x and 246-6x scores respectively. All three fired .30 calibers.

CAMILLUS

The Camillus club had 21 shooters at their final match of the winter league season on April 8th. TIM SIMBARI had a narrow win over Jim Stekl. Top five shooters for the day were: 1.) Tim Simbari .3080, 2.) Jim Stekl .3122, 3.) Bob Lamanna .3396, 4.) Elwood Ellison .3528, 5.) Jerry Masker .3732. Jim Stekl had small group for the day, a .210 (fired through the snow flurries of the day).

JIM STEKL however was to take the season honors, calculated on the best five out of seven matches. The top shooters in the standings were: 1.) Jim Stekl .3082 (shooting a 6 American throughout), 2.) Jerry Masker .3327, 3.) Tim Simbari .3330, 4.) Bob Lamanna .3362, 5.) Elwood Ellison .3417, 6.) Jim Kusche .3483, 7.) Ed Joiner .3620, 8.) Bud Welsh .3653, 9.) Bill Fuller .3726, 10.) Bill Ward .3757.

DUNHAM'S BAY

For the April Fool's Day match there were 27 shooters muddling around on the firing line, but when the event was over, BARRY DEVLIEGHER had the big trophy. Top five scores for the 100 meter heavy varmint class: 1.) Barry Devliegher .2362, 2.) Dick Johnson .2532, 3.) Don Sargood .2548, 4.) Don Cameron .2780, 5.) Al Gustafson .2826. The agg winner shot a 6PPC, Stolle action, Hart barrel, Premier 42X scope, 27.8 grains of H322 with Euber 68 grain bullets and Federal primers. Seely Masker was the gunsmith, and Lee Six the stocker. In the hunter class Bill Neimi, with a 249-13x beat out Mike Mastrianni's 248-10x and two other shooters.

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IBS SCORE SHOOTING NATIONALS
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SEPTEMBER 8 & 9, 1990

PRE-REGISTRATION REQUIRED BY IBS
LETTER OF INTENT BY AUGUST 8, 1990

Classes--Hunter, Varmint Hunter, Varmint for Score
Saturday September 8, 100 Yards, Starting time 10:00 AM
Sunday September 9, 200 Yards, Starting time 9:00 AM
Awards--all classes
- 1st, 2nd, 3rd both ranges
- Traveling Trophy and Keeper, 2nd, 3rd, 4th, 5th Grand Agg
- Top ten awards
- Match pins
- Participation Patches
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If you need any additional information, please contact us.
Randy Fritz--717-784-6368
Bill Creasy--717-784-8021 (after 6 PM)

_____ class(s) shooting September 8
_____ class(s) shooting September 9
_____ Amount remitted
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- 1 gun 2 days--$28.00 includes IBS fees
- 2 guns 1 day--$20.00 includes IBS fee
- 2 guns 2 days--$40.00 includes IBS fees

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ADDRESS_____

IF POSSIBLE FORWARD COMPETITOR CARDS
NOTE ANY SPECIAL RELAYS NEEDED FOR EQUIPMENT SHARING

Mail to: Randy Fritz
RD #3, Box 572,
Bloomsburg, Pa. 17815

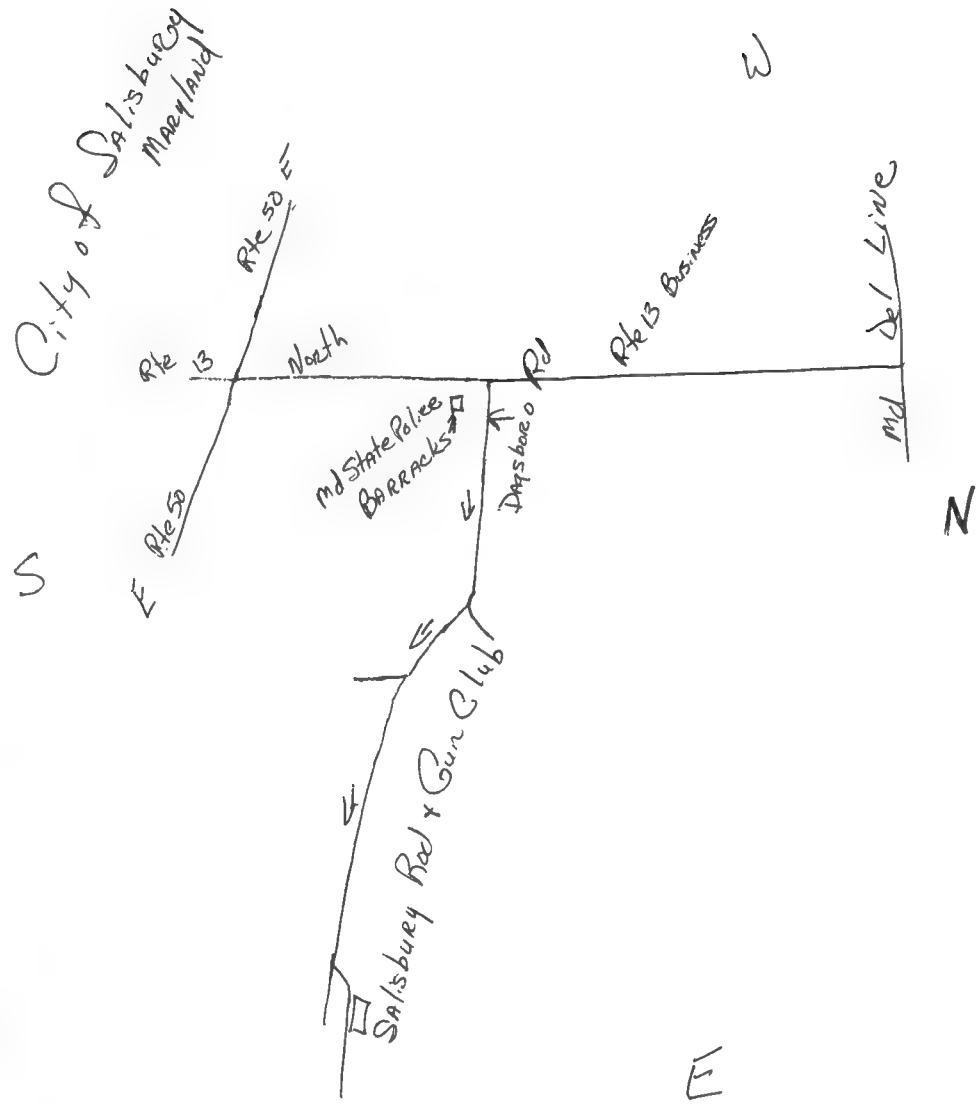
SALISBURY

The April Fool's Day shoot at the Salisbury Rod & Gun Club had a pretty decent turn-out (10 shooters), and that proves something . . . but we're not certain just what. Jack Lewis, the IBS Director for the club, puts out a pretty good little match bulletin, and in that little publication he tells us that the hunter class winner, Ron Poisker, bravely fired with a broken foot, and on crutches. The only explanation apparently offered was "running around the bedroom with the lights out"?? (How many of us feel that Jack Lewis ducked his obvious . . . indeed very obvious . . . duty . . . as a reporter . . . to GET THE FACTS? He may be a good director . . . he may put on a good match . . . but alas, we can only conclude that . . . as a reporter . . . he lacks the killer instinct!)

Hunter class: 1.) Ron Poisker 247-8x, 2.) P. Devaney 246-9x. Ron shot a 6x44 on a Remington 700 action with a Hart barrel, Leupold 6X scope, 39.5 grains of 4351 with Rubright 68 grain boat-tail bullets and Remington 7½ primers. Gunsmith was Jim Borden.

Varmint hunter class: There was only one shooter, Jim Fykes, who, to everyone's surprise, emerged the winner, with a 246-6x score.

Varmint for score: There were 10 shooters here, and the top five were: 1.) Jack Lewis 250-18x, 2.) W.E. Fykes Sr. 250-17x, 3.) Marshall Lewis 250-16x, 4.) Doug Rea 250-16x, 5.) E. Fykes 250-13x. The agg winner, Jack Lewis, shot a 6x39 Improved (!) on a Hart 1A action with a Lilja barrel and a 36X Tasco scope. The load was 27.0 grains of T-32 with Bruno 68 grain flat base bullets and CCI primers, and gunsmithed by Henry Buhrman. (As an aside, the cartridge is based on IMI 7.62x39 cases).



DUNHAM'S BAY

MYLES HOLLISTER got out in front of the field on February 4th, and took a clear victory in the heavy varmint class at the Bay. There was snow in the area, and only 13 shoaoters made an appearance on this day. Top five shooters were: 1.) Myles Hollister .2570, 2.) Brian Hollister .2736, 3.) Bob Griffin .2860, 4.) Bill Niemi .3042, 5.) Tom Lake .3106. Mr. Hollister shot a 6PPC, Wichita action, Chanlynn barrel, Leupold 36X scope, 31.0 grains of Norma 201 with his own 68 grain flat base bullets and Federal primers. He did his own gunsmithing, and Norm Dixon was the stocker. In the accompanying hunter class match, with only two shooters, Tom Svack, shooting a 30x44, was first with a 250-11x score, and Bill Niemi's 247-10x was (obviously) second.

INTERNATIONAL BENCHREST SHOOTERS APPLICATION

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( ) IBS Membership and Precision Shooting Magazine — $30/year

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( ) Club Membership $30.00 for American Continents
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MAIL MEMBERSHIPS TO: JOAN BORDEN, R.D. #1 Box 244A, Tunkhannock, Pa. 18657

Make checks payable to IBS.

Allow up to 60 days for first magazine to arrive.

SOUTH CREEK

(Reported by Jack Deming)

Jim Oliver proved that "he ain't over the hill yet" by winning the winter's aggregate at South Creek, and the Hart Rifle Barrel Company's club championship for the second straight year. Jeff Ely tried to prove Casey Stengel's "It ain't over 'till it's over", by making a late season run at the leader, but the big guy hung on for the win. The winter league was also the scene of some pretty good shooting by several up-and-coming junior shooters.

Eight "inside" benches, hearty fare from the kitchen, and a warm clubhouse made the winter league downright civilized . . . as winter leagues go. The final match of the season was concluded with the club's free pizza party.

Good food, good times, good people, and good shooting . . . that's what our winter league is all about.

Jack Deming

January 14, 1990

Group: 1. Bill Gebhardt ..... .3022
2. Jason Oliver ..... .3076
3. Joe Borden ..... .3174

Score: 1. Jeff Ely 249-14x
2. Jim Oliver 249-14x
3. Guy Green 249-11x

January 28, 1990

Group: 1. Jim Oliver ..... .2914
2. Jeff Ely ..... .2970
3. Jack Deming ..... .3246

Score: 1. Al Skiver 250-15x
2. Jim Oliver 250-15x
3. Guy Green 250-13x

February 11, 1990

Group: 1. Jack Deming ..... .2810
2. Jim Oliver ..... .2990
3. Carl Lynn ..... .3412

Score: 1. Al Skiver 250-14x
2. Floyd Stohner 250-10x
3. Dave Obert 250- 8x

February 25, 1990

Group: 1. Jeff Ely ..... .4096
2. Guy Green ..... .4154
3. Jack Deming ..... .4310

Score: 1. Floyd Stohner 248-8x
2. Rich Hileman 246-5x
3. Jim Oliver 244-7x

March 11, 1990

Group: 1. Jack Deming ..... .2240
2. Bill Gebhardt ..... .2344
3. Jason Oliver ..... .2520

Score: 1. Jim Oliver 250-17x
2. Guy Green 250-13x
3. Jeff Ely 250-12x

March 25, 1990

Group: 1. Jeff Ely ..... .3332
2. Jack Deming ..... .4110
3. Carl Lynn ..... .4200

Season's Agg.

Group: 1. Jim Oliver ..... .3010
2. Jeff Ely ..... .3065
3. Jack Deming ..... .3251

Score: 1. Jeff Ely 1249-69x
2. Jim Oliver 1248-69x
3. Floyd Stohner 1246-60x

CAMILLUS

The Camillus club had 23 shooters on hand on March 25th for their heavy varmint class match. The weather wasn't real bad, but switching winds kept everyone from an aggregate that they could be pleased with. Thus, on a day when no one was really happy, JIM STEKL turned up the least unhappy, when he won the match with a .3450 score. Following in the standings were: 2.) Jim Kusche .3586, 3.) Herb Hoverstad .3614, 4.) Tim Simbari .3694, 5.) Elwood Ellison .3740. Herb Hoverstad had small group, a .183. The agg winner shot a 6 American, Remington 40X action, Hart barrel, B&L scope, 30.5 grains of 748 powder with 68 grain Coye bullets. The gunsmith was Hart, and the stocker was Fred Sinclair.

INTERNATIONAL BENCHREST SHOOTERS

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R.D. #1 Box 244A
Tunkhannock, Pa. 18657
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MATCH SCHEDULE CHMN.
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Phone: (716) 335-5617

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IBS-H/2	200 Yard	Hunter Black	13x31	250	15#	10.00
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(Patch design courtesy of Peter "Rabbit" Callan)

1990 IBS Championships

200/300 yard
Long Distance Championships
June 9th and 10th, Weikert, Pa.

National Championships (4 gun)
August 20-25th
Kelbly's Range, No. Lawrence, Ohio

Score Championships
September 8-9th
Mainville, Pa.

1990 TENTATIVE IBS SCORE SHOOTING SCHEDULE

June 3 — SALISBURY ROD & GUN CLUB, Salisbury, Maryland — 100 Yards H-VH-VFS, 11 AM

June 10 — LEETOWN IWLA, Leetown, West Virginia — 100 Yards H-VH-VFS 10 AM

June 10 — GUTHSVILLE ROD & GUN CLUB, Guthsville, Pa. — 100 Yards H-VH-VFS, 10 AM

June 16-17 — New York State Championships, DUNHAM'S BAY FISH & GAME CLUB, Dunham's Bay Lake George, N.Y. — 100 Yards Sat. 11 AM, 200 Yards Sun. 10 AM, H-VH-VFS

June 24 — SULPHYR SPRINGS R & R CLUB, Muncy, Pa. — 100 Yards H-VH-VFS, 10 AM

June 24 — CAPITAL CITY RIFLE & PISTOL CLUB, Augusta, Maine — 100 Yards VFS, PM

July 1 — GUTHSVILLE ROD & GUN CLUB, Guthsville, Pa. — 100 Yards H-VH-VFS, 10 AM

July 1 — SALISBURY GUN CLUB, Salisbury, Maryland — 200 Yards H-VH-VFS, 11 AM

July 1 — CAPITAL CITY RIFLE & PISTOL CLUB, Augusta, Maine — 100 Yards H-VH-VFS, 9 AM

July 8 — UNION COUNTY SPORTSMENS CLUB, Weikert, Pa. — 100 Yards H-VH-VFS, 11 AM

July 14-15 — Pennsylvania State Championship, MAINVILLE SPORTSMENS CLUB, Mainville, Pa. — 100 Yards Sat. 10 AM, 200 Yards Sun. 9 AM H-VH-VFS

July 22 — "York County Championship" IWLA YORK, York, Pa. 100 Yards H-VH-VFS, 11 AM

July 28-29 — Maine State Championships, CAPITAL CITY RIFLE & PISTOL CLUB, Augusta, Maine — 100 Yards Sat. 9 AM, 200 Yards Sun. 9 AM H-VH-VFS

Aug. 5 — SULPHYR SPRINGS R & R CLUB, Muncy, Pa. — 100 Yards H-VH-VFS, 10 AM

Aug. 5 — SALISBURY GUN CLUB, Salisbury, Maryland — 100 Yards H-VH-VFS, 11 AM

Aug. 5 — LEETOWN IWLA, Leetown, West Virginia — 100 Yards H-VH-VFS 10 AM

Aug. 11-12 — 200+300 Yard Score Championships, UNION COUNTY SPORTSMENS CLUB, Weikert, Pa. — 200 Yards Sat. 11 AM, 300 Yards Sun. 10 AM H-VH-VFS

Aug. 19 — CAPITAL CITY RIFLE & PISTOL CLUB, Augusta, Maine — 100 Yards H-VH-VFS, 9 AM

Aug. 19 — GUTHSVILLE ROD & GUN CLUB, Guthsville, Pa. — 100 Yards H-VH-VFS, 10 AM

Sept. 2 — CAPITAL CITY RIFLE & PISTOL CLUB, Augusta, Maine — 100 Yards VFS, PM

Sept. 2 — IWLA YORK, York, Pa. 200 Yards H-VH-VFS, 11 AM

Sept. 8-9 — IBS Score Championships, MAINVILLE SPORTSMENS CLUB, Mainville, Pa. — 100 Yards Sat. 10 AM, 200 Yards Sun. 9 AM H-VH-VFS

Sept. 16 — UNION COUNTY SPORTSMENS CLUB, Weikert, Pa. — 200 Yards H-VH-VFS, 11 AM

Sept. 16 — SALISBURY GUN CLUB, Salisbury, Maryland — 100 Yards H-VH-VFS, 11 AM

Sept. 23 — DUNHAMS BAY FISH & GAME CLUB — 100 yards H

Sept. 30 — SULPHYR SPRINGS R & R CLUB, Muncy, Pa. — 100 Yards H-VH-VFS, 10 AM

Oct. 7 — LEETOWN GUN CLUB IWLA, Leetown, West Virginia — 100 Yards H-VH-VFS 10 AM

Oct. 7 — SALISBURY GUN CLUB, Salisbury, Maryland — 200 Yards H-VH-VFS, 11 AM

Oct. 14 — UNION COUNTY SPORTSMENS CLUB, Weikert, Pa. — 100 Yards H-VH-VFS, 11 AM

Oct. 21 — IWLA YORK, York, Pa. 100 Yards H-VH-VFS, 11 AM

Nov. 4 — SALISBURY GUN CLUB, Salisbury, Maryland — 100 Yards H-VH-VFS, 11 AM

1990 TENTATIVE IBS VARMINT SHOOTING SCHEDULE

June 9-10 — IBS 200+300 Yard Championships, UNION COUNTY BENCHREST CLUB, Weikert, Pa. — Sat. 200+300 Yard HB or LV, Sun. 200+300 Yard HV, 8:30 AM both days

June 24 — CAPITAL CITY RIFLE & PISTOL CLUB, Augusta, Maine — 100 Yards LV-HV, 9 AM

June 30 - July 1 — Pa. State Championships, SOUTH CREEK-NORTHERN SPORTSMEN, Fassett, Pa. — Sat. 100 Yards HV-AM, LV-PM, Sun. 200 Yards HV-AM, LV-PM, 8 AM both days

July 14-15 — DUNHAM'S BAY FISH & GAME CLUB, Dunham's Bay Lake George, N.Y. — Sat 100 Yards HV-AM, LV or HB-PM, Sun. 200 Yards HV-AM, LV or HB-PM, 9 AM both days

July 21-22 — NYS Championships, CAMILLUS SPORTSMENS CLUB, Camillus, N.Y. — Sat. 100 Yards HV-AM 9 AM, LV or HB-PM, Sun. 200 Yards HV-A,, 9 AM, LV or HB-PM, Clyde Hart Memorial Match-Sun.

Aug. 4-5 — IWLA, York, Pa. — Sat. 100 Yards Sporter+HV, Sun. 200 Yards Sporter+HV, 8 AM both days

Aug. 20-25 — IBS National Championships, KELBLY'S RIFLE RANGE, North Lawrence, Ohio — Mon.-Tues. 100,200 Yard HB, Wed.-Thurs. LV+ Sporter, Fri.-Sat. HV, 8 AM each day

Sept. 2 — CAPITAL CITY RIFLE & PISTOL CLUB, Augusta, Maine — 100 Yards HV+LV, 9 AM

Sept. 23 — DUNHAMS BAY FISH & GAME CLUB, Memorial Shoot — 100 meters HV

Sept. 29-30 — FAIRCHANCE GUN CLUB, Smithfield, Pa. — Sat. 9 AM 100 Yards HV-AM, HB-PM, Sun. 8 AM 200 Yards HB-AM, HV-PM

Oct. 28 — MAINVILLE, Mainville, Pa. — 100 Yards HV, 11 AM Hunter rifles to shoot group on a score target.

INTERNATIONAL SCHEDULE

GRASSE / FRANCE: European Supershoot April 28/29/30 May 1st — Light Varmint & Heavy Varmint 100/200 M. Serves as European L.V. & H.V. I.B.S. Championships. IBS Registered.

DOBBIACO / ITALY: June 16/17 Heavy Varmint 100/200 M.

RHEINE / GERMANY: July 06/07 Heavy Varmint 100/200 M.

SAALFELDEN / AUSTRIA: August 04/05 Heavy Varmint 100/200 M.

SOUPPES / FRANCE: Trophy Cup Sept. 08/09 Heavy Varmint 200/300 M.

BISLEY / ENGLAND: Sept. 13/14 Heavy Varmint 100/200 Y. Sept. 15 Unlimited 1000 Y.

WIESBADEN / GERMANY: Sept. 28/29 Heavy Varmint 100/300 M.

CODOGNO / ITALY: Oct. 06/07 Heavy Varmint 100/200 M.

GENESEE

Dear Dave,

Here is our schedule of matches for the year. We are planning on shooting just 100 yard matches but hope to include a few 200 yarders if at all possible. (Our facilities has a stream running through it which has to be crossed by a bridge. At the present time it is unusable.)

Registration will be from 9:00 to 9:45 AM. The first relay will start at 10:00. Registration fees are $5.00 with a 50% pay back. We are only offering Varmint for Score (Heavy Varmint Class) this year. Last year we tried a "Factory Class" and only got one individual to shoot, and he never came back. This year anyone with a gun 13½ pounds or under can compete.

April 28
May 19
June 16
July 14
August 18
September 15
October 6

For further information they can call me at (716) 381-9847. Thanks again.

Sincerely,
John C. Wagner
42 High Hill Drive
Pittsford, N.Y. 14534

PROJECT "1200"

Project "1200 is a membership drive. The program is designed to increase the INTERNATIONAL BENCHREST SHOOTERS membership to 1200 individuals. This is the first membership drive sponsored by the I.B.S. and presents an opportunity for current members to share the organization with a friend who is interested in accuracy, competition and friendship. There is no other organization which offers the same benefits that the I.B.S. offers to its members **Accurate guns, Accurate shooting,** and **Accurate information.**

Project "1200" will be conducted in four recruiting periods, each period lasting three months as listed below.

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PERIOD 2 - JANUARY 1, 1990 TO MARCH 31, 1990
PERIOD 3 - APRIL 1, 1990 TO JUNE 30, 1990
PERIOD 4 - JULY 1, 1990 TO SEPTEMBER 30, 1990

Project "1200" will have four levels of achievement. A current member who signs up 3 new members during one recruiting period (one of which can be his renewal membership) will receive a **hat** with a unique and distinct **IBS Recruiter patch embroidered** on the front. Sign up 5 new members during one recruiting period and receive a heavyweight I.B.S. polo shirt. Sign up 10 members over the course of the recruiting year and receive a windbreaker with an appropriate and significant patch of distinction. A bonus award in the form of a one year free IBS membership plus a windbreaker will be made to current members who sign up 12 new members during the recruiting year. To get you started an application form is found at the bottom of this page. Extra forms can be obtained from Joan Borden at the address listed below or just send the applicant's complete name and address, along with the appropriate fee to Joan Borden. You must sign your name as sponsor to be appropriately credited fror the signup.

I.B.S. membership and P.S. for one year (U.S. & CANADA) - $30.00
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NAME _____

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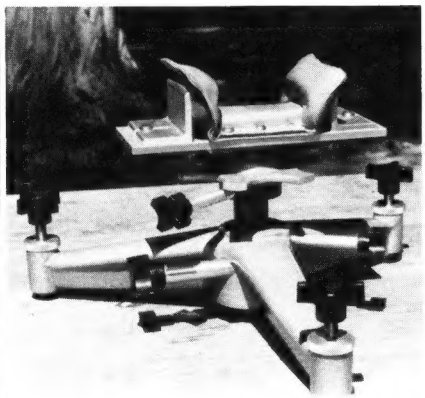

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